

PENNSYLVANIA GAME COMMISSION
WIND ENERGY VOLUNTARY COOPERATION AGREEMENT
February 23, 2007

The Pennsylvania Game Commission (Commission) seeks to coordinate wind energy projects with wind energy developers (Cooperator) in order to work collaboratively to ensure that wind-energy development project sites are developed in both an environmentally conscientious manner and with best regard to the conservation of the Commonwealth's wildlife resources.

Whereas, the Commission under its jurisdiction from Title 34 (Game and Wildlife Code) has authority to avoid, propagate, manage and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the laws of this Commonwealth relating thereto.

Whereas, both the Commission and Cooperator support renewable energy initiatives and are dedicated to arriving at uniform guidance, in the absence of comprehensive state regulations, on how best to avoid, minimize, and/or potentially mitigate adverse impacts to wildlife resources.

Whereas, the Commission and Cooperator, in an effort to best avoid, minimize, and/or mitigate potential adverse impacts with specific intent to birds and mammals, have entered into this Cooperative Agreement in an effort to standardize wildlife monitoring protocols and wildlife impact review methods associated with wind-energy development projects in a mutually beneficial and flexible manner and with high regard to both parties goals, objectives, and purviews.

Therefore, the Commission and Cooperator enter into this Cooperative Agreement and agree as follows:

1. The Cooperator will notify the Commission of any potential wind energy development sites (or an expansion of an existing site with the addition of 5 or more turbines), at least fourteen months prior to construction. The notification prior to the initiation of construction at the site will allow the Commission to provide as much known information on bird and mammal resources which may be present and/or potentially impacted by the development of the proposed wind-energy project. The notification should include a brief narrative of the project's planned development and proposed construction times and include as much detailed information as available such as: an original copy of the U.S.G.S.

topographic map(s) depicting the proposed project area boundary limits with the quadrangle name and associated county identified on it, the proposed project site's general infrastructure delineations (both known and planned) to include access roads, electric transmission lines, wind turbine locations, planned surface impact areas, development and future maintenance of the project, and any known wetland areas or predetermined wildlife habitat regimes which are deemed to be of critical importance or high value.

For those projects, which the Cooperator has already initiated prior to the effective date of this agreement, or that are planned for construction prior to the fourteen-month time frame noted herein, the Cooperator shall submit the required information within ninety days (90) from the date of this agreement.

For all other projects, which are currently under construction prior to the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* (post-construction bird & bat mortality) as contained herein. Further, within 90 days of the agreement date, the Cooperator can provide to the Commission a listing of all projects, which are planned for construction to begin within 12 months from the date of this agreement. The listing will include all available site-specific project information as more clearly specified within this paragraph for each project identified on the list. For each project identified on the list which construction commences within 12 months from the date of this agreement, the Cooperator shall only be required to comply with the monitoring efforts within Paragraph 6 *iii* as contained herein. All other paragraphs, provisions, terms and conditions, which are not inconsistent to the above, shall remain in full force and effect.

2. It is understood between the Cooperator and Commission that both parties may support the use of other potential funding mechanisms or processes which directly or indirectly reduce the overall costs associated with the Cooperator's monitoring requirements as identified herein providing further the intent of those monitoring requirements remain the same.

3. The Commission and Cooperator will share all relevant information concerning wildlife resources under the jurisdiction of the Commission in and around the project area and the potential adverse impact to those resources. Shared information will include all known publicly available data from past/current/future monitoring efforts and pre and post-construction study results relative to the subject project area. The Commission further agrees to consider all existing relevant wildlife resource information provided by the Cooperator and the Commission will reduce to the fullest extent possible any further requests made to the Cooperator to provide additional relevant data and/or monitoring results which can be ascertained from known existing data regarding potential known wildlife impacts.
4. The Commission will provide the Cooperator with the results of all its internal reviews and provide written comment and or meet with the Cooperator within 45 days of receiving the information specified in Paragraph 1, as well as the results of the Pennsylvania Natural Diversity Inventory, and all pre and post-monitoring methods and recommendations on how best to avoid and reduce direct and indirect impacts to birds and mammals. Additional coordination will occur from the Commission for actions needed in regards to species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) to include all state threatened and endangered bird and mammal species known to occur or determined to exist within or adjacent to the project area.
5. The Commission in consultation with the Cooperator will determine the risk level for monitoring and survey efforts. If needed, the risk level may be adjusted based on new relevant information. The Commission may request the Cooperator conduct an additional year's post-construction monitoring if a T&E species is killed or other mortality is deemed to be at an unacceptable level for any species. The Cooperator may request a reduction in the mortality monitoring effort for the second year based on the first year's mortality results. Such a request by either party for additional or reduced monitoring shall be made in writing by the party requesting a change and an informal meeting will be arranged between the parties to discuss and mutually agree upon any changes in monitoring efforts.

will be that no eagle survey is requested or conducted

3. Breeding Bird Surveys–

Goal: Assess risk to bird species listed in the Pennsylvania Comprehensive Wildlife Conservation Strategy (CWCS) in order to avoid and minimize direct and indirect impacts to these species and evaluate the potential for habitat enhancement/mitigation measures.

Objective 1) Proactively evaluate critical wildlife resources that may cause risk to the future stability of project operation.

Objective 2) Use the data to help develop and implement the most appropriate post-construction habitat reclamation and management for the site.

Objective 3) Determine if state listed species are present. If present then further coordination with the Commission is required in order to avoid, minimize, or mitigate potential impacts to the species or their habitat.

If the project area is within an Important Bird Area (IBA) as previously designated by the Audubon process, or within an area supporting birds identified as those priority species of “greatest conservation concern” within the Pennsylvania Comprehensive Wildlife Conservation Strategy, the Cooperator will conduct a survey to confirm or deny the presence of the species. The survey will consist of three days of effort (one day in May, two in June, separated by at least one week). Projects with existing data on species of special concern will be coordinated with the Commission as to the appropriate survey methods required to be used by the Cooperator.

4. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

ii. Bats

Hibernacula

Goal: Determine if any hibernacula exist within the project area in order to avoid and minimize impacts to active hibernacula and the associated bat species due to project development and its operation.

Objective 1) Conduct an on site field review to locate and determine use of potential bat hibernacula in the project area.

Objective 2) Survey bat hibernacula for species presence and abundance in order to assess potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid, minimize, and mitigate adverse impacts to bats and or enhance their habitat from project construction and operations.

1. Pre-construction survey- If recommended by the Commission, the Cooperator is responsible for surveying the project area for any caves, abandoned mine portals, or other openings that may harbor bats as per the Commission's protocol. All openings with potential as suitable bat hibernacula will be surveyed by a qualified bat biologist according to Exhibit B.

Goal: Determine those bat hibernacula existing within 5 miles of the project area that may induce additional avoidance and minimization measures due to anticipated adverse bat impacts from project operations.

Objective 1) The Commission will conduct surveys to locate and determine use of potential bat hibernacula within 5 miles of the project area boundary.

Objective 2) The Commission will survey bat hibernacula (outside of the project area) for species presence and abundance in order to establish potential impacts to bat species during the planning phase of the project construction.

Objective 3) Evaluate the potential to avoid and minimize adverse impacts to bats and their habitat from project construction and operations.

2. Prior to the Cooperator conducting the field survey(s) as noted in Paragraph 6 (ii), the Commission will conduct a literature search for other mine portals/caves/openings which are suitable and/or known bat hibernacula and are on or within 5 miles of the proposed wind-energy project boundary delineation. The information will be provided to the Cooperator along with the relevant known bat hibernacula as per the Commission's review and the Commission's recommendations on the need for the Cooperator to conduct additional surveys based on the probable presence of Pennsylvania listed threatened, endangered, and/or candidate bat species. If the Commission recommends additional surveys, the Cooperator will conduct those surveys with a qualified bat biologist according to the attached protocol Exhibit B.
3. Cooperator will conduct pre and post-monitoring surveys as outlined in the Commission's attached Exhibit B & C. The maximum level of effort per project is one-year pre-construction survey and two years post-construction. The minimum level of effort is no bat survey is required.

4. Acoustic Monitoring

Goal: Determine the presence, activity, and temporal use of the project area by bats in order to avoid and minimize potential adverse impacts.

Objective 1) Surveys will be conducted to evaluate the levels of bat activity within the project area and determine their temporal patterns.

Objective 2) Evaluate the potential to avoid and minimize adverse impacts to bats based on their probable use of the project area during the project's construction and future operations.

Cooperator will conduct pre- and post-construction acoustic surveys based on priority level. This survey will assess the level of bat activity for both hibernating and tree bats. The priority level will be used for acoustic monitoring due to a lack of knowledge on the temporal and spatial activity of tree bats, as outlined in the Commission's attached Exhibit B. The maximum level of effort per project is one-year pre-construction and one-year post-construction from April 1 through November 15. The minimum level of effort is from July 15 to October 15 before and after construction.

5. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.

6 iii. Post-Construction Bat & Bird Mortality Monitoring

Goal 1) Determine the mortality of bats and birds from project operation and whether those mortality rates would cause an unacceptable level of impact and if needed induce additional minimization or mitigation measures.

Objective 1) Conduct mortality surveys in the most cost-effective and proficient manner.

Objective 2) Provide a mechanism to evaluate the proficiency of the project's mortality survey methodology.

Goal 2) Assess the predictive value of pre-construction monitoring, minimization and avoidance measures by comparing those results with post-construction mortality.

Objective 1) Identify those protocols or monitoring methods that need revision, adaptation, replacement, or abandonment because of their level of success.

Objective 2) To make appropriate adjustments to monitoring protocol and future effort as indicated by the acquired information.

1. The Cooperator will perform the bird and bat mortality monitoring as outlined in the Commission's attached mortality protocol Exhibit C for a minimum of two years post-construction. Mortality studies shall be conducted from April 1 through November 15 by a qualified biologist(s) having expertise in the identification of bats and/or birds and at the interval as noted in the attached Exhibit C.
2. The Commission will to the extent feasible, be made available to provide consistency and oversight management for all conducted surveys.
7. Cooperator agrees to utilize to the greatest extent possible, all reasonable and feasible generally accepted wind industry and Commission best management practices relevant to the conservation of wildlife resources during construction and subsequent operation of the wind-energy facility. The Commission shall provide copies of all known and updated best management practices to the Cooperator on an annual basis.
8. Commission agrees to issue a special use permit defining the terms and conditions for use throughout the project area by the Cooperator's designated biologist(s) for all bats, birds, and state listed threatened or endangered species which are collected while conducting the Commission's approved monitoring plan and

mortality protocol. The general format for the special use permit is attached as Exhibit D and may be automatically renewed upon the anniversary date of the permit, providing further that the permit terms and conditions have been strictly adhered to and this Cooperation Agreement remains in effect.

9. The Commission agrees not to pursue liability against the Cooperator due to any incidental takings of the Commonwealth's bird and mammal resources for which it has purview under Title 34 (Game & Wildlife Code) as a result of the Cooperator's wind-energy development and operations within the Commonwealth of Pennsylvania providing further such incidental takings were not malicious in their intent and the Cooperator remains in compliance with the terms and conditions of this agreement and has with a good faith effort avoided and minimized potential adverse impacts by way of implementing best management practices and Commission guidance as noted herein.

The Commission and Cooperator agree to work cooperatively in the future to avoid, and minimize further impacts to the Commonwealth's bird and mammal resources as new relevant project information becomes available. In the event that an incidental take occurs upon a Pennsylvania listed threatened or endangered species of bird or mammal during the operation of any of the Cooperator's wind-energy facilities, the Cooperator agrees to take all reasonable measures as deemed appropriate by the Commission and the Cooperator to further avoid, minimize and/or mitigate such wildlife losses in the future.

10. Commission recommendations or decisions under the Cooperative Agreement do not supercede any comments, decisions, or recommendations of the United States Fish & Wildlife Service.
11. The Cooperator agrees to provide coordinated access, upon prior notice during normal business hours, to all its wind-energy facilities as deemed necessary by Commission staff in order to ensure both parties compliance to this agreement. All Commission access shall be coordinated as far in advance as possible and subject to all the normal safety measures implemented by the Cooperator with regard to access to the facility.

12. Either party upon their own discretion and reason can terminate this agreement in its entirety after having first provided the other party written notification of such termination forty-five (45) days in advance of such termination date. Said written notification to be sent certified mail to the respective parties place of address as noted herein. Termination can be conditioned to exclude those projects identified, which remain in compliance with the agreement.
13. It is understood between the parties that information resulting from the Cooperator's compliance with this agreement shall be treated with the highest affordable level of confidentiality available unless otherwise agreed to in writing by both parties OR if it is necessary to support the Commission's waiver of liability set forth in Paragraph 9 hereof. It is the intent of both parties to release to the general public relevant project monitoring & mortality information deemed to be in the best interest of both the Commission and Cooperator. Release of information will be by mutual consent only.
14. Assignment: The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any affiliate (as defined below) without the approval or consent of the Commission provided that (i) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment and (ii) the Cooperator notifies the Commission of any proposed assignment in accordance with this Agreement. The Cooperator may assign this Agreement, or any project covered under the terms of this Agreement, to any non-affiliate (as defined below) provided that (a) the Cooperator is not in default of this Agreement with respect to the project(s) being so assigned at the time of the proposed assignment, (b) the proposed assignee has agreed in writing to be bound by all of the terms and conditions of this Agreement, (c) the Commission has met with the proposed assignee and the Cooperator, after being notified of the proposed assignment, to discuss the terms and conditions of the project(s) covered by the assignment and (d) the Commission consents to the proposed assignment in writing, which consent shall not be unreasonably withheld, conditioned or delayed. For purposes of this section, an "affiliate" of the Cooperator refers to any person, corporation or entity that (i) has a direct or indirect ownership interest in the Cooperator or vice

versa or (ii) is subject to common operating control and is operated as part of the same system or enterprise as the Cooperator. Any person, corporation or entity that is not an "affiliate" as defined above shall be a non-affiliate for purposes of this section. At the request of the Cooperator, the Commission and the assignee shall execute, after said assignment is approved if required, a new Agreement with terms identical to the terms of the Agreement at the time of the assignment.

15. Notices. All notices demands or requests required or permitted under this Agreement shall be in writing and shall be personally delivered or sent by certified United States mail (postage prepaid, return receipt requested), overnight express mail, courier service, facsimile transmission or electronic mail with confirming receipt (in the case of facsimile transmission and electronic mail with the original transmitted by any of the other aforementioned delivery methods) addressed as follows:

If to Commission to: Pennsylvania Game Commission
ATTN: William A. Capouillez, Director
Bureau of Wildlife Habitat Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

and

If to Cooperator to:

or to such other person at such other address as a Party shall designate by like Notice to the other Party. Unless otherwise provided herein, all Notices hereunder shall be effective at the close of business on the Day actually received, if received during business hours on a Business Day, and otherwise shall be effective at the close of business on the first Business Day after the Day on which received.

16. No Third-Party Beneficiaries. This Agreement is not intended to, and does not, confer upon any Person other than the Parties hereto and their respective successors and permitted assigns, any rights or remedies hereunder.
17. Entire Agreement. This Agreement, including all Schedules hereto, constitutes the entire agreement between the Parties hereto with respect to the matters contained herein and therein, and all prior agreements with respect to the matters covered herein are superseded, and each Party confirms that it is not relying upon any representations or warranties of the other Party, except as specifically set forth herein or incorporated by reference hereto.
18. Amendment. This Agreement may not be amended or modified except by a written instrument signed by each of the Parties hereto.

IN WITNESS WHEREOF, Commission and Cooperator have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION

ATTEST:

Executive Director

Date

COOPERATOR

ATTEST:

President or Vice-President

Date

Company Name

EXHIBIT A (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Protocols to Monitor Bird Populations at Industrial Wind Turbine Sites

**Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007**

Pre and Post-Construction Monitoring of Birds

Following is a classification of raptor concentration locations across Pennsylvania based on the number and type of species found. Pre-construction bird monitoring efforts at wind energy developments will be scaled based on this classification. A complete listing of Pennsylvania sites in which raptors concentrate is provided at the end of this document (Table 1).

Competent and experienced field ornithologists that are mutually agreed upon by the Cooperator and the PGC shall conduct migratory raptor or breeding bird surveys.

I. Classification of Monitoring Effort for Raptors

A three-tiered approach is recommended for raptor migration monitoring at prospective wind development sites:

A. High Priority Sites – Major raptor concentration points, including areas documented in migration.

Raptor Migration Survey Effort: At least one year full-time fall and spring monitoring with a corresponding effort post-construction.

B. Moderate Priority Sites -- Lesser disconnected ridges in the Valley and Ridge Province and near escarpments in the Allegheny Plateau Province.

Raptor Migration Survey Effort – At least one year full-time fall monitoring pre-construction and a corresponding effort post-construction, and where eagle migration is noted, spring monitoring.

C. Low Priority Sites -- Sites of flat terrain where there are no updrafts and low-priority sites as listed separately.

Raptor Migration Survey Effort – None.

Several sites designated as Low Priority. They lack a standard set of raptor migration data, but there may be significant migration at the site at some time of year. It is not required, but prudent to do a field check for raptors during periods when migration is most likely to occur to avoid risk to raptors migrating there.

II. Protocols for Diurnal Raptor Monitoring

Golden eagles tend to use the north-south trajectory of the ridges in south-central and southwestern parts of the state. Unlike other raptors, their spring route northward is similar to their fall migration route southward.

Diurnal raptor surveys should follow standards and forms used by the Hawk Migration Association of North America (www.hmana.org). The HMANA daily log form and instructions are attached as one sheet.

1. Site Location: The diurnal raptor monitoring site should be chosen with maximum count of migration as the goal. A good view of the escarpment, looking into the direction where most raptors are expected to fly (the windward side of the mountain) is necessary for a thorough count. A secondary site may be needed to see raptors during different prevailing winds. The site location and the reason for the change should always be indicated on the field form. Geographical information for the site should also be collected (coordinates in Latitude / Longitude, directions to site) for general reporting.
2. Field Season: The fall field season includes the period August 15 through December 15 and spring field season is March 1 through March 31.
3. Time and Frequency: Count hours are 9:00 to 5:00 EDT from August 15 through October 30, and 8:00 to 4:00 EST from November 1 through December 15. Emphasis shall be placed on periods when migration is greatest in numbers or when high priority species are most likely to occur. Therefore, sampling can be reduced to three days a week from 15 August through 15 September, but should cover days when a large flight can be expected.
4. Equipment: The counter should use binoculars and or a scope. Hand-held weather instrument are preferred for gathering weather data. A laser rangefinder would be useful for measuring distance of raptors to the escarpment or proposed turbine sites.
5. Data Collection: All raptors considered migratory will be tallied by date and hour using the HMANA Daily Reporting forms. Data for both eagle species will be recorded on a separate form (see below). General instructions for entering data are provided in back of the HMANA form, including the codes for various weather data (e.g. sky, wind). Weather data will be recorded by the hour; wind data can be collected later from the meteorological tower. HMANA sites often use the Beaufort wind scale (see HMANA form), but directly measuring wind with a wind gauge also is acceptable.

Flight Pattern Notes: Keep separate tally of raptors observed flying in the zone of the anticipated rotor sweep area where raptors may be at greatest risk. Separate tallies can be made on the HMANA form by designating the position of the birds or by using multiple HMANA forms for one day with a form designated for each of the three sectors delineated below. Participants are invited to devise their own form to accommodate this collection of behavior data. *This should be accomplished without compromising the total raptor count conducted with the HMANA protocol.* Raptors that are not using the ridge for migration should also be noted on the field form.

The relative position of raptors should be categorized with respect to the anticipated wind turbine rotor zones for the specific development in question. All raptors should be recorded passing the area, divided into the three sectors:

Code	Sector In Relation to Rotor Zone
A	The West (or North) side of proposed turbine area
B	Along the summit within a 200-m (656-foot) swath, where turbines would likely be situated
C	The East (or South) slope of the zone, but not within 100 m (328 feet) of the mountain top or spine.

If birds changed sectors, this should be indicated by sequential letters (e.g., AB, BC, ABC). Each individual bird should be classified by flight pattern.

Behavior: The type of flight should be recorded according to the following categories:

Code	Type of Flight
D	Direct flight with few changes in direction, all less than 30 degrees
I	Indirect flight during which more than one circle was recorded, but more than 50% of flight is without such turns
S	Soaring flight during which more than 50% of time is circling/
H	Flight that appeared to be for hunting
P	Birds that perched

6. Flight Altitude: Use the following table to describe the *general flight* of raptors at the site for each hour of observation. Additional notes on the flights of golden and bald eagles or other species of interest should also be recorded either as part of the Golden and Bald Eagle Data Form (Page 5) or field notes to be added to the data file of the site observation.

Code	Flight Altitude
0	Below eye level
1	Eye level to 30 meters
2	Birds easily seen with unaided vision (eyeglasses not counted as aids)
3	At limit of unaided vision
4	Beyond limit of unaided vision but visible with binoculars to 10X

5	At limit of binoculars
6	Beyond limit of binoculars 10X or less but can detect with binoculars or scope of greater power (note magnification)
7	No predominate height

All birds observed at the site are to be counted. Residents, or other individuals suspected to be previously counted, should be recorded.

7. Golden and Bald Eagle Data Collection: Eagle observations should be recorded on the Golden and Bald Eagle Data Sheet. (The eagle form also can be used to document details of flight line and behavior of other high priority species.) The eagle form includes a simple set of codes that allow for location and behavior options. These codes are provided at the bottom of the form. The weather can be recorded on the form in the style (codes) used on the HMANA form. Observers should fill in notes about behavior liberally in the right hand column or on extra sheets and use extra sheets as necessary.

Golden and Bald Eagle Data Sheet

Use as addendum to HMANA form

LOCATION:	Date:	Sky:
OBSERVER:	Start:	Stop:
Wind:		

For Data Codes, see bottom of form.

#	Sps. ^a BE,GE	Time ^b (military)	Age ^c (J/Sub/Ad)	View ^d (D/V)	Height of Flight ^e (L/M/H)	Direct. of Flight ^f (NE, N...)	Flight Type ^g (P, G, S)	Flight Path ^h (RT, PRS, PRN, ..)	Behavioral Notes Interactions with other birds
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

^a Species: Bald Eagle = BE, Golden Eagle = GE, see HMANA form for other species. ^b Time: use military time (0800, etc.). ^c Age: indicate either Juvenile (J), Sub-adult (S), or Adult (A). More detail on BE plumage types are appreciated but not necessary (e.g. Basic I,II, III, etc.). ^d View: D = Dorsal, V = ventral, DV = Both. ^e Height of flight: L = 100 feet (30 m), M = 100 – 400 ft. (approx. tower ht.), H = above 400 ft. (tower ht.). ^f Direction of flight: N, NE, E, SE, S, SW, W, NW. ^g Flight type: P = Powered (flapping), G = Gliding, S = Soaring. ^h RT – Moving along Ridge Top, PRN = Parallel to Ridgetop Northside, PRS Parallel to Ridgetop Southside, VS = Valley to South, VN = Valley to North, XR = Crossed ridge, LR – left ridge.

Use additional sheets if necessary.

III. Pre-Construction Sampling for Breeding Birds

1. Survey Methods: Breeding bird surveys should be conducted once in May and two visits in June. Points should be established systematically at 250-meter intervals (or at 500 meters in grassland settings) using a grid or track that covers the projected development site. Based on overall project size and project configuration, the PGC will be flexible with regard to breeding bird survey sampling intervals.

A circle is delineated around each point of 50-meters and allowance is made for detecting birds outside that ring (unlimited circle). Observers should be experienced or be trained at judging distances, using a range-finder and local landscape features as cues. Sample period should be divided into three periods, starting with the first three minutes, the subsequent two minutes, and the final five minutes. These time bands allow comparisons between these data sets with other point-counts (including the BBS route data) of 3- and 5-minute lengths (Ralph et al. 1995).

Sampling should occur in the morning when detection of birds is greatest. Counts should not be conducted in periods of heavy rains or high winds. Each location should be approached quietly in order to avoid disturbance of the birds and to observe birds near the sample point, but outside of the detection circle. Each bird should be recorded in the first period it is observed. A small bull's eye is provided on the point count data sheet for registering the general location of the bird. The up position is North with the lines dividing the circle into four quadrants. Additional notes on location of birds can be made on separate sheets. Birds detected while flying over should be counted separately.

The location of each point should be registered on a separate form using GPS (Attachment Form Wind 7008). The use of standard four-letter species alpha codes, breeding bird atlas codes, and other standard abbreviations are helpful to the standardized collection of data (Ralph et al. 1993, Hamel et al. 1996, PA Breeding Bird Atlas website). A stopwatch or other chronometry is very helpful to ensure conformity to the time band data periods. A compass or GPS unit with compass capacity is needed to identify the position of the birds.

The field observer should provide evidence of rare or unexpected species by taking photographs, making field recordings, or field sketches. Digital recordings are preferable because of their ease of storage and transfer.

In each successive time-band, the observer should attempt to relocate each singing bird and record its detection in that period. Each observation should be categorized as either inside or outside the designated center circle (50 meter radius). If a bird moves from one side to the other of the count circle, it should be designated as the original position to inside, the original observation point should be noted. There are columns for non-singing observations provided for birds within and outside the circle. Care is needed to avoid duplicate counting of individuals at the same point or at multiple points.

The data collected with the removal method point-counts should be analyzed with methods outlined by Farnsworth et al. (2002). The program SURVIV also is used for finding estimates of densities and associated variables (White 1983). This program is available from the U.S.G.S. Patuxent Wildlife Research Center website (<http://www.mbr-pwrc.usgs.gov/software.html#a>).

Alternate point count methodologies that address observer detection effects, such as spot-mapping (I.B.C.C. 1970, Ralph et al. 1993) or distance sampling (Buckland et al. 2001, Rosenstock et al. 2002), may be used as an alternative to the point count data collection described herein.

2. Area Searches are effective for developing a species site list and detecting birds not as effectively detected by point counts (Ralph et al. 1993). This approach may replace or supplement the point count method.

The observer visits the variety of habitats at a site and records all birds encountered. As for any field survey, the weather conditions and field times also are recorded. The field time can be used as a measure of effort made by the observer and the bird data can be interpreted as birds per party hour or a similar efforts measure. There is a form for use in Area Search Surveys that will organize observations (Attachment Form Wind 7008). Any breeding behavior should be recorded using standardized Breeding Bird Atlas codes (see 2nd Pennsylvania Breeding Bird Atlas website and point count form). The locations of Species of Special Concern and Watch List species should be recorded (NAD27 format). Additional information about bird sightings and behavior can be recorded separately.

At least three area-searches should be conducted at the construction site and these searches include periods when Birds of Conservation Concern are most detectable (<http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=164510>). Since many raptors are more easily detected fairly early in the nesting season, a full sample protocol should include a field trip conducted from mid-March to April 30. A second trip in May would also be appropriate for earlier nesting species and has the potential for early-arriving forest migrants. A third trip should be taken in the peak of the nesting season for most songbirds in the period from June 1 through July 10 (but, June would be more effective than a July date). Some early-nesting species also can be detected in post-nesting period when dependent young are easily detected.

Data collected on these forms, maps, and associated documents shall be sent to the Pennsylvania Game Commission as outlined in the Special Use Permit.

Pennsylvania Breeding Bird Point Count				
Site:		Observer:		Date:
Point #		Assistant:		Start time:
Sky:		Wind:	Temp:	Stop time:

Indiv. & Posit.	Species Code ^a	1 0 – 3 min.		2 3 – 5 min.		3 5 – 10 min.		Non-song Cues		Fly Over #	Breeding Code, Behavior, and Other Notes
		<50m	>50m	<50m	>50m	<50m	>50m	<50m	>50m		
		1									
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

^a Use standard 4-letter alpha codes for species names available at PBBA website, USGS, and various references.

Notes:

Codes for Breeding Bird Point Counts and Area Searches			
Sky Condition Codes		Wind Speed Codes (Beaufort Scale)	
Code	Sky condition indicator	Code	Wind Speed Indicators
0	Clear or a few clouds	0	Smoke rises vertically (< 1 mph, <2 kph)
1	Partly cloudy (scattered) or variable sky	1	Wind direction shown by wind drift (1-3 mph, 2-5 kph)
2	Cloudy (broken) or overcast	2	Wind felt on face; leaves rustle (4-7 mph, 6-12 kph)
4	Fog or smoke	3	Leaves, small twigs in constant motion (9-12 mph, 20-29 kph)
5	Drizzle	4	Dust rises; small branches move (13-18 mph, 20 – 29 kph)
7	Snow	5	Small trees in leaf begin to sway (19-24 mph, 30-38 kph)
8	Showers		

Pennsylvania Breeding Bird Atlas Breeding Codes (BC)	
<i>For further explanations of BCs, Safe Dates, and other Breeding Bird Information, see the website of the 2nd Pennsylvania Breeding Bird Atlas</i>	
Observed	
O	Observed within safe dates, but not in suitable habitat
Possible	
X	Bird seen or heard in suitable nesting habitat within safe dates
Probable	
T	Territorial behavior observed
P	Pair observed
C	Courtship behavior observed
U	Used nest of species found
A	Agitated behavior or anxiety calls given by adults
Confirmed	
CN	Bird seen carrying nesting material
NB	Nest building observed at nest site
DD	Distraction display
FL	Recently fledged young observed
CF	Adult carrying food or fecal sac
ON	Occupied nest found, contents unknown
NE	Nest found containing eggs
NY	Nest found containing young

**Table 1: Tiered Approach to Classifying Risk to Migrant Raptors
by Wind Power Development**

**Risk assessment based on concerns for general raptor migration, for Bald Eagle (BAEA) or Golden Eagle (GOEA) migration or concentrations.*

High Potential Risk Sites					
Site	Counties	Raptor Concern*	Spring Migr.	Important Bird Areas at Location	Hawkwatch Sites (HMANA)
Allegheny Front	Bedford, Blair, Clearfield, Centre	General, BAEA, GOEA	Yes	#84 Allegheny Front	Yes
Bald Eagle / Brush Mountains	Centre, Blair, Huntington	General, GOEA	Yes	#32 Bald Eagle Ridge	Yes
Conneaut Marsh / Geneva Marsh	Crawford	BAEA	Yes	#7 Conneaut / Geneva Marsh	No
Kittatinny Ridge / Blue Mountain	Monroe, Northampton, Carbon, Lehigh, Berks, Schuylkill, Perry, Franklin, Cumberland	General, BAEA, GOEA	Yes	# 51 Kittatinny Ridge / Hawk Mt. Sanctuary	Yes
Lake Erie Shore	Erie	General, BAEA	Yes	# 1 Presque Isle, # 2 Roderick Reserve	Yes (NY)
Lower Susquehanna River	York, Lancaster, Dauphin, Perry	BAEA	Yes	#56 Conjohela Flats, #57 Conowingo Reservoir, Muddy Run, #46 Sheets Island Archepeligo	No
Pymatuning Res. / Hartstown Complex	Crawford, Mercer	BAEA	Yes	#3 Pymatuning, Hartstown Complex	No
Second Mountain / Mauch Chunk Ridge	Lebanon, Schuylkill, Carbon	General, BAEA, GOEA	No?	#43 St. Anthony's Wilderness, #44 Second Mountain Corridor	Yes
Tuscarora / Cove Mountains	Franklin, Fulton, Perry, Huntington, Juniata	General	Yes	#36 Tuscarora Ridge / The Pulpit	Yes

High Potential Risk Sites (continued)					
Site	Counties	Raptor Concern*	Spring Migr.	Important Bird Areas at Location	Hawkwatch Sites (HMANA)
Tussey Mountain	Bedford, Blair, Huntington, Centre	General, GOEA	Yes	#81 Greater Tussey Mountain, #35 Rothrock State Forest	Yes
Upper Delaware River	Wayne, Pike, Monroe	BAEA	Yes	#60 Upper Delaware Scenic River	No
Moderate Potential Risk Sites					
Allegheny Ridge	Lycoming	General, GOEA	Yes	None Listed	No
Backlog Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Bald Mountain	Luzerne	General	No	None Listed	No
Berry Mountain	Dauphin, Perry	General	Yes	None Listed	No
Big / Sugar Valley Mountains	Clinton	General	No	None Listed	No
Brush Mountain	Centre	General	No	None Listed	No
Catawissa Mountain	Columbia, Luzerne	General	No	None Listed	No
Dunning / Evitts / Loop / Lock / Canoe Mountains	Bedford, Blair	General, GOEA	Yes	# 76 Canoe Creek Watershed	No
Jack's Mountain	Huntington, Mifflin, Snyder	General, GOEA	Yes	None Listed	Yes
Line / Little Mountains.	Northumberland	General, GOEA	No	None Listed	No
Mahantango / Buffalo Mountains	Dauphin, Schuylkill, Perry	General	Yes	None Listed	No
Meadow Mountain	Somerset	General	Yes	None Listed	None
Moosic Mountain	Lackawanna, Wayne	General	No	None Listed	No
Nescopeck Mt.	Columbia, Luzerne	General, BAEA	No	None Listed	No
Nittany Mountain	Centre	General, GOEA	Yes	None Listed	No

Moderate Potential Risk Sites (cont.)					
Site	Counties	Raptor Concern*	Spring Migr.	Important Bird Areas at Location	Hawkwatch Sites (HMANA)
North White Deer Ridge	Lycoming	General, GOEA	Yes	None Listed	Yes (historic)
Penobscot / Lee / Wilkes-barre / Wyoming Mts.	Luzerne, Columbia	General, BAEA	No	None Listed	Yes
Peter's Mountain	Dauphin, Perry	General	No	# 43 St. Anthony's Wilderness	Yes (historical)
Shade Mountain	Fulton, Huntington, Mifflin, Juniata	General	No	None Listed	No
Shamokin Mountain / Montour Ridge	Union, Snyder, Montour, Northumberland	General	Yes	None Listed	No
Sharp / Pisgah Mountains	Lebanon, Schuylkill, Carbon	General	No	None Listed	No
Sideling Hill	Fulton, Huntington	General, GOEA	Yes	None Listed	No
South Mountain	Adams, Franklin	General	Yes	#40 Michaux State Forest	No
Spring Mountain	Carbon	General	No	None Listed	No
Stone Mountain	Huntington	General, GOEA	Yes	#35 Rothrock State Forest / Stone Mountain	Yes
Town Ray Hills	Fulton, Bedford	General, GOEA	Yes	None Listed	No
Wills Mountain	Bedford, Blair	General, GOEA	Yes	None Listed	No
Low Potential Risk Sites					
Big Mountain	Northumberland, Columbia	General	No	None Listed	No
Broad Mountain	Franklin	General	No	None Listed	No
Buck Mountain	Columbia, Luzerne	General	No	None Listed	No
Buffalo Mountain	Centre, Union	General	No	#37 The Hook Natural Area	No

Low Potential Risk Sites (cont.)					
Site	Counties	Raptor Concern*	Spring Migr.	Important Bird Areas at Location	Hawkwatch Sites (HMANA)
Chestnut Ridge	Fayette, Westmoreland	General	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
First / Thick Mountains	Centre	General	No	None Listed	No
Front Mountain	Mifflin	General	Yes	None Listed	No
Laurel Hill	Fayette, Westmoreland, Somerset, Cambria	General, GOEA	No	#26 Youghiogheny Valley / Ohiopyle State Park	No
Little Allegheny Mt.	Somerset, Bedford	General	No	None Listed	No
Locust / Nesquehoning Mts.	Schuylkill, Carbon	General	Yes	None Listed	No
Long Mountain	Mifflin, Centre	General	No	None Listed	No
Mahanoy Mountain	Northumberland	General	No	None Listed	No
Martin Mountain	Bedford	General	No	None Listed	No
Negro Mountain	Somerset	General	No	None Listed	No
North Mountain	Columbia, Sullivan, Luzerne, Wyoming	General	Yes	# 42 Loyalsock State Forest, # 48 Dutch Mt. Wetlands, # 49 Ricketts Glen State Park	No
Paddy Mountain	Centre, Union	General	No	None Listed	No
Polish Mountain	Bedford	General	No	None Listed	No
Savage Mountain	Bedford	General	No	None Listed	No
Warrior Mountain	Bedford	General	No	None Listed	No

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Exhibit B (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

Pre and Post-Construction Monitoring of Bat Populations at Industrial Wind Turbines Sites

**Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007**

I. Classification of Monitoring Effort for Bats for Pre and Post-Construction Monitoring

Pre- and post-construction bat monitoring efforts will be scaled to the type of bat activity on or within 5 miles of the proposed wind power project area, as identified in the following three site types. A **Hibernacula of Concern** is identified as a known hibernaculum that houses a large number of bats (1000+ counted in an internal survey or 100+ captured via trapping), one that supports a diverse number of bat species (4 or more species), or which houses the state threatened small-footed bat (*Myotis leibii*) or the state and federally listed endangered Indiana bat (*Myotis sodalis*) in Pennsylvania.

Sites are classified in the following three categories:

A. High Priority Sites:

- 1) Hibernacula of Concern exist on or within 1 mile of the project area or several hibernacula occur within 1 mile of the project area.
- 2) A hibernaculum with >5000 bats is on or within 5 miles of the project area.
- 3) Any known occurrence supporting breeding or hibernating state-listed threatened or endangered species is present on or within 5 miles of the project area.

Pre-construction work required:

- 1) Consultation with PGC required for state-listed bat occurrences.
- 2) Site-specific surveys include: spring migration and/or fall telemetry of a maximum of 10 or more individuals as determined by the PGC to determine areas of high use and travel corridors.
- 3) One season (April 1-November 15) of acoustic monitoring to determine activity levels of bats within the project area.
- 4) One season of mist netting following USFWS guidelines to determine the presence of Indiana bats and potential use of the area as maternity colonies. Work is conducted by approved bat consultants that are prepared to adhere with the transmitter requirements.

Post-construction work required:

- 1) Two years of mortality monitoring with possible extension based on severity of impacts.
- 2) Post-construction acoustic monitoring for one season (April 1 – November 15) and concurrent with mortality monitoring.

B. Moderate Priority Sites:

- 1) Hibernacula of Concern exist between 1 and 5-mile radius of project area.
- 2) Any hibernacula on or within 5 miles of the project area contains between 1,000 and 5,000 bats.
- 3) One hibernaculum containing between 100 and 1000 bats on or within 1 mile of the project area.

Pre-construction work required:

- 1) Pre-construction acoustic monitoring for a spring (April 1- April 30) and fall season (July 15 – November 15), and concurrent with mortality monitoring.

Post-construction work required:

- 1) Two years of mortality monitoring.
- 2) Post-construction acoustic monitoring for a spring (April 1- April 15) season and a fall season (July 15 – November 15), and concurrent with mortality monitoring.

C. Low Priority Sites: Criteria

- 1) No known presence of state-listed bats on or within 5 miles of the project area.
- 2) No known Hibernacula of Concern on or within 5 miles of the project area.
- 3) No hibernaculum with more than 100 bats exists in the project area.

Pre-construction requirements: Acoustic monitoring from July 15-October 15.

Post-construction: Standard post-construction mortality monitoring.

II. Protocols for Locating and Surveying Potential Hibernacula

Hibernacula (natural caves, mines, tunnels, and other underground workings) within the project area should be located using mineral literature (The Pennsylvania Cave Database, maps and records from the Office of Surface Mining, and the PA Bureau of Abandoned Mines) and properly investigated by a USFWS approved bat consultant.

Due to the increased bat activity around such sites and/or the presence of threatened and endangered species, Hibernacula of Concern on or within five miles of a proposed wind development site triggers bat monitoring efforts. The Pennsylvania Game Commission (PGC) will notify the developer if such a hibernaculum is known on or within five miles of the proposed project and the developer should enter into consultation with the PGC to determine if additional protection or investigation will be useful to siting turbines. The PGC may conduct a survey in or around the project area for potential hibernacula that are not currently known and survey them for the developer. In the event that the PGC survey results confirm a previously unknown hibernaculum the PGC will notify the Cooperator and further coordination will be required. If a mine is located and contains multiple entrances, then all the bats captured at each entrance will be added together to determine if the site qualifies as a Hibernaculum of Concern.

The following progression of action should generally be followed in order to meet the agreement, as fits the site classification hierarchy above:

- 1) A consultant/cooperator will perform a literature search for potential hibernacula within project area.
- 2) Following the literature review, a consultant will conduct ground searches to examine each identified potential hibernaculum, record the location with a GPS, and search for unknown openings (mine collapse, abandoned tunnels, new caves, etc) within the project area.
- 3) Consult with PGC to determine if any sites have ever been surveyed for bats.
- 4) PGC may conduct literature and ground searches for a potential hibernaculum located up to 5 miles from the project area.
- 5) PGC may survey hibernacula up to 5 miles from the project area.
- 6) Newly discovered sites, and sites that have not been investigated within 10 years, will be surveyed via the methods and protocols set forth in the USFWS mine sampling protocol.
- 7) Bat consultants from the USFWS approved list must be hired to examine any potential hibernacula within the project area.
- 8) If a state-listed species is located within the project area, the bat consultant will consult with the Cooperator and PGC to discuss telemetry protocols, effort levels and site specific details.
- 9) If the federally endangered Indiana bat is known to exist at any time within 5 miles, telemetry may be requested, and areas of use are to be determined. Buffer areas around the Indiana bat location should not be included in the project area.
- 10) Data must be entered on provided sheets (Appendix A) and submitted to the PGC before construction. Maps should indicate all turbines, hibernacula surveys, and results of telemetry if applicable.
- 11) All captures of state-listed bats must be photo documented as described in Appendix A.
- 12) Genetic samples (wing punches) and hair sample collection need to be taken on all individual state listed species. Each individual will also be banded with a unique band of appropriate size (Indiana bat bands must be obtained by the consultant from the PGC). Consultants should contact the PGC prior to performing work.

III. Protocols for Mist Netting Surveys

The length of the project area (or summation of all roads, whichever is longer) will be tallied. There will be 1 mist netting station per kilometer of the project area. For projects that are not linear in design, a polygon surrounding the entire project area will be tallied and there will be 2 stations per square kilometer.

- 1) Mist netting shall follow USFWS guidelines in terms of both level of effort and sampling protocol except for the below additions:
- 2) All bat consultants to perform this work must be on the USFWS approved Indiana bat list and obtain a special use permit from the PGC.
- 3) Proposals should be submitted and approved by PGC before work commences and include a map of the project area, locations of the turbines, and estimated locations targeted for net deployment.
- 4) All captures of Indiana bats should be photo-documented with profile shots of the head and shots of the foot and keeled calcar for Indiana bats as shown in Appendix A. Photos of small-footed bats should clearly show the entire facial mask and foot as well.

- 5) Genetic samples (wing punches) and hair samples should be collected and marked for all Indiana, small-footed, red, hoary, and silver-haired bats. Consultants should be prepared to attach a unique band to each of these species and should consult with the PGC prior to the commencement of work, with all data recorded on data sheets provided (Appendix A).
- 6) The bat consultant should have transmitters prepared for all captures of small-footed and Indiana bats in order to locate roost trees. Transmitters should be capable of operating for 21 days on the state frequency of 172 MHz. The PGC must be notified no later than 72 hours post capture and attachment of the transmitter.

IV. Protocols for Standardized Acoustic Monitoring of Bats

The recommendations following for acoustical monitoring are geared towards assessing temporal and spatial activity of bats, with an emphasis on the migratory tree bats.

- 1) All met towers installed on site should be equipped with acoustic monitoring devices as close to rotor zone as possible. It is suggested to have contractor attach equipment before tower is raised.
- 2) If possible, Met towers should be maintained for at least one year following construction in order to complete acoustic monitoring.
- 3) All projects should use the same type of detector throughout the study.
- 4) Detectors should record from 30 minutes prior to sunset to 30 minutes following sunrise every day.
- 5) Acoustical monitoring will record the number of bat passes per hour and will be entered on data sheet provided.
- 6) All recorded calls should be permanently archived for possible research needs and submitted with final report.
- 7) Provide data regarding wind speed, humidity, and ambient temperature every 10 minutes from the project area and concurrent with acoustic and mortality monitoring surveys.
- 8) All met tower locations must be recorded with GPS unit (decimal degrees, NAD 27 preferred) and should be reported on project maps.
- 9) All information gathered must be entered on Pennsylvania Game Commission survey forms (Appendix A).
- 10) Copies of all acoustic data sheets will be submitted in conclusive end-of-year reports to the PGC Harrisburg, PA at the end of every calendar year.

APPENDIX A
COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission, Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Procedure and format for permittee reports to the PA Game Commission when conducting wind turbine pre-construction bat netting and bat detector surveys.

The report is divided into five sections which include: (1) Cover page, (2) Site Survey Record, (3) Bat Measurement and Capture Data Forms, (4) Maps and (5) Photo Documentation.

Section 1 - Cover

A separate cover page should be provided for each project with the accompanying data of Sections 2 through 5 contained within. An example is provided.

Section 2 - Bat Netting/Acoustic Survey Record

(FORM Wind-70008-PRE)

This is a **mandatory** two-page summary of site(s) surveyed, captures and bat detector tallies of bat passes. It should be completed for all sites surveyed, including those with no captures. If an additional technique other than mist netting and bat detector work is conducted, it should be described in remarks. Complete 1 for each site survey night (If site is trapped twice, 2 site survey records are required, etc.).

This form may not be modified for reporting because it is used for data entry. If necessary, supplemental pages may be added to report unique data.

Section 3 - Bat Measurement and Capture Data Form

(FORM P-70008-M)

This form is **mandatory** for:

1. *Myotis sodalis* captures
2. *Myotis leibii* captures
3. Bats you are banding and all band recaptures
4. All radio-tagged bats (describe transmitter in remarks)
5. Bat species not usually found in Pennsylvania*.

* Pennsylvania species: *Myotis lucifugus*, *Myotis septentrionalis*, *Myotis leibii*, *Myotis sodalis*, *Eptesicus fuscus*, *Pipistrellus subflavus*, *Lasiurus borealis*, *Lasiurus cinereus*, and *Lasionycteris noctivagans*

This form may not be modified for reporting because it is used for data entry.

*The surveyor also has the option to use this form for measuring and reporting all bats. All measurements should follow North American collector standards (Nagorsen, D. W. and R. L. Peterson. 1980. *Measurements and Weights*. Pp. 22-26 in *Mammal Collectors' Manual*. Royal Ontario Museum, Publications in Life Sciences). Banded bat information will be maintained in a database and future recaptures of your bands will be reported to you.*

Section 4 - Maps

An example is provided. All survey sites will be reported on a map (preferably a 7.5' USGS Topographic Map) so that locations can be accurately located and coordinates verified.

Section 5 - Photo Documentation

An example is provided. It is required that photographs be taken of identification characteristics of all *M.sodalis*, *M.leibii*, and species not usually found in PA. The photos should be labeled with the site, date and capture number.

Return reports to address on the heading of this page within 90 days of project completion.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

WIND FARM PERMITTEE
BAT CAPTURE / ACOUSTIC MONITORING PRE-CONSTRUCTION SURVEY REPORT

Permit Number _____

Project Name: _____

Company/
Organization/
Permittee Name: _____

Address: _____

Phone: (_____) _____ - _____ **Fax:** (_____) _____ - _____

E-Mail: _____

Project Supervisor Name: _____

Supervisor Contact: Phone: (_____) _____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is being performed for:

BAT -NETTING/ACOUSTIC SITE SURVEY RECORD

1. Survey Date: _____ 2. Company Name: _____

3. Reporter: _____ 4. Assistants: _____

5. Site Name and/or Number: _____

6. Site is (circle one): hibernation site summer habitat

7a. If hibernation site circle one: limestone mine, coal mine, limestone cave, sandstone cave, RR tunnel,
other structure, describe - _____.

7b. If summer habitat, describe area being sampled (e.g. forested stream or forest clearing with stream):

8. County: _____ 9. 7.5' Quad.: _____

10. Was site GPS'd (required) YES - NO

11. Geographic Coordinates (D-M-S): Latitude: _____°-_____'-_____”N, Longitude: _____°-_____'-_____”W
Datum (circle one): NAD27 (Preferred), NAD83, WGS84, Other: _____

12. Ownership and Access: (Who owns site or controls access? Give name and address.) _____

13. Time (military) & Temperature: Start Time _____ h Stop Time _____ h Total Minutes: _____
Start Temp. _____ °C End Temp. _____ °C

14. General Weather (circle one): Clear; Partly Cloudy; Mostly Cloudy; Cloudy; Drizzle; Intermittent Rain;
Steady Rain; Thunderstorms; Snow; Other: _____.

15. General Wind Conditions (circle one): Calm, Breezy (Leaves Rustling), Windy (trees swaying).

16. Capture Setup at Site (Minimum of 2 sets required at each site):

Set #	Type	Count	Dimensions	Description	TOTAL AREA (m)
1	Nets	4	12m x 2.6m	Stacked over trail	124.8 sq. m

Total Capture Area: _____ sq. m

(Site Survey Record – Continued) Site Name/No.: _____ Date: _____

17. Describe habitat 150 m around site: (topography and vegetation including dominant tree species.)

18. Was reproductive status checked? YES / NO (if “NO” only enter numbers in **Total** columns)

***CAPTURE RESULTS**

Species	Number of Adult Females				No. Juv. Fem.	Total No. Fem.	Number of Adult Males		No. Juv. Male	Total No. Males	Species Totals	
	NR	PG	L	PL			SCR	NR				
												<i>Eptesicus fuscus</i>
<i>Myotis lucifugus</i>												
<i>Myotis septentrionalis</i>												
<i>Myotis leibii</i>												
<i>Myotis sodalis</i>												
<i>Eptesicus fuscus</i>												
<i>Pipistrellus subflavus</i>												
<i>Lasiurus borealis</i>												
<i>Lasiurus cinereus</i>												
<i>Lasionycteris noctivagans</i>												
Other – specify:												
Other – specify:												
Reproductive Status: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen. *Complete Measurement and Capture Data Form for all: (1) <u>Myotis sodalis</u> , (2) <u>Myotis leibii</u> , (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA.											Grand Total	

Comments:

DATE: _____

19. ACOUSTIC MONITORING: (Tallies of bat passes / hour. Use military time and record sunset/sunrise times in comments.)

Hour # _____	Hour # _____	Hour # _____	Hour # _____	Hour # _____
Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h
Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C	Start Temp: _____ °C
Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h	Start Time: _____ h
End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C	End Temp: _____ °C
<i>For bat detector passes where calls can be identified by Genus and/or species, record identification data below by call tallies</i>				
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Genus: _____	Genus: _____	Genus: _____	Genus: _____	Genus: _____
Species: _____	Species: _____	Species: _____	Species: _____	Species: _____
No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____	No. of Calls: _____
Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____	Hr # No. of Unk. Calls: _____
Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____	Hr # Total Calls: _____

Comments:

Bat Measurement and Capture Data Form

(Complete for all (1) *Myotis sodalis*, (2) *Myotis leibii*, (3) bats you are banding or band recaptures, (4) radio-tagged bats and (5) bat species not usually found in PA)

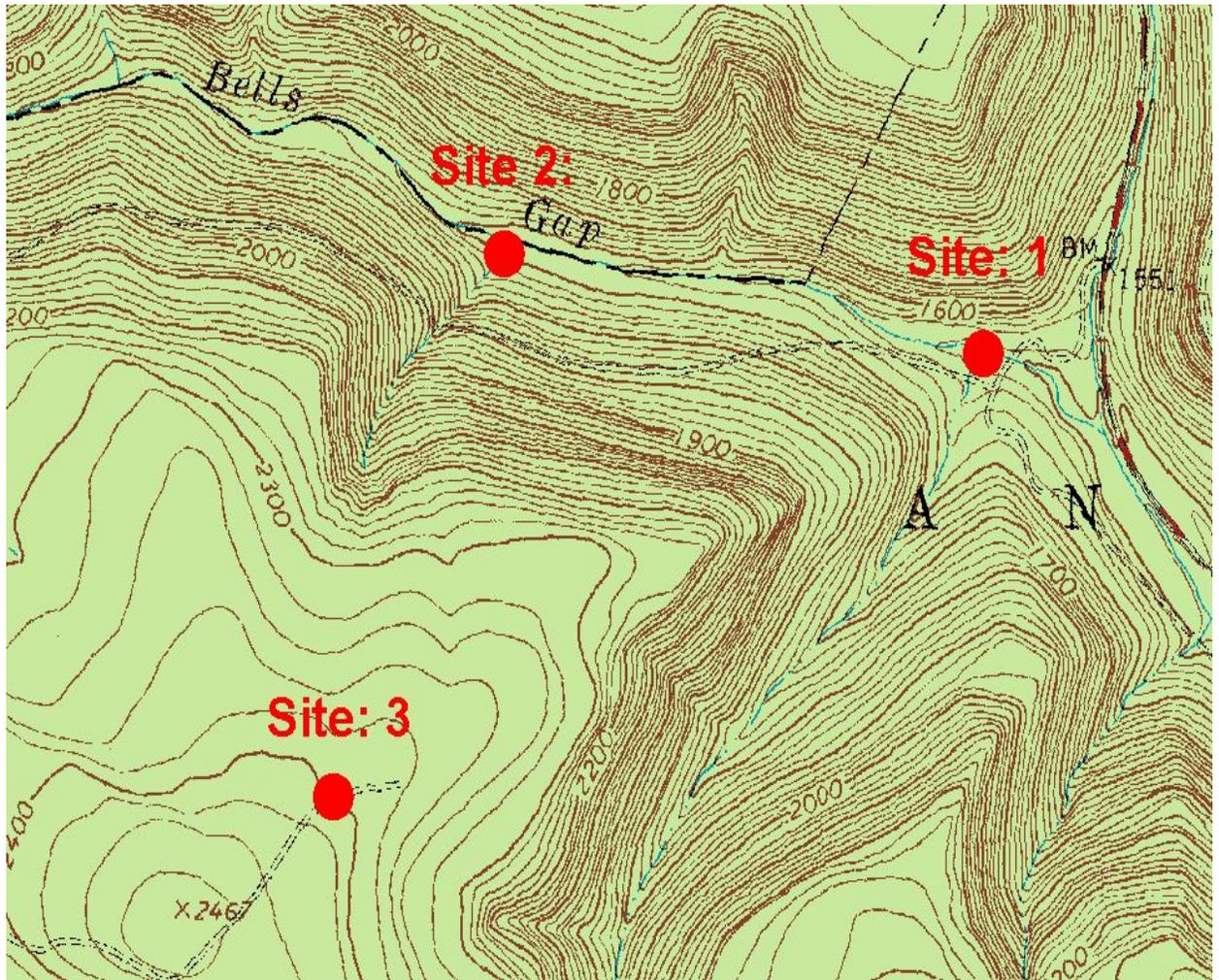
Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												
<i>Repro.Condition: NR= nonreproductive, PG= pregnant, L= lactating, PL= post lactating, SCR= scrotal/epididymis swollen</i>														
Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												
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Site Name Or Number:				Date:			Set No. Captured In:			Name of Person Identifying the Bat:				*Capture Number:
Height in meters captured above ground surface: _____ m				Body Measurements (grams and millimeters)					Band Information (if banded) (Band Males on bat's RIGHT fa., Females on bat's LEFT fa.)					Transmitter Attached? If so: Frequency (mHz)
<u>Species</u>	<u>Sex</u>	<u>Age</u>	<u>Repro. Condition</u>	<u>Wt. (g)</u>	<u>Ear</u>	<u>Tragus</u>	<u>Fore- arm</u>	<u>Hind Foot</u>		<u>Recapture Yes/No</u>	<u>Band Material</u>	<u>Band Color</u>	<u>Band Inscription</u>	<u>Band on Left/Right</u>
<u>Time of Capture</u>	<u>Photo Taken</u> Yes / No	Remarks:												

*Capture Number = number in sequence by site.

DRAFT

Section 4 - Maps (example)

Blair Co., Blandburg Quadrangle, Bells Gap Area.
Location of Sites 1, 2, and 3 for Project PA-24



DRAFT
Section 5 - Photos (example)

Male *Myotis sodalis* captured at **Site 1**

Capture date: **7/18/01**

Capture Number: **06**

Portrait



Keeled Calcar



Exhibit C (Explicitly Used in Conjunction with the Wind Energy Cooperative Agreement)

**Protocols to Monitor Bat & Bird Mortality at Industrial
Wind Turbines Sites**

**Commonwealth of Pennsylvania
Pennsylvania Game Commission
February 23, 2007**

Post-Construction Mortality Monitoring

I. Duration and Frequency of Monitoring:

All mortality monitoring should take place daily for the period between April 1 and November 15 for 2 complete years following construction, unless other mortality information is available and the PGC can adequately justify a reduced monitoring effort. For higher risk golden eagle migration routes, as designated in page 11 of Exhibit A, additional monitoring may be requested. Mortality monitoring should commence at sunrise and an appropriate number of surveyors must be hired to complete surveys of all turbines within 8 hours. Turbines that are being chosen for monitoring should be determined with the initial proposal so the location of acoustic monitoring devices can be coordinated to occur at the same locations.

II. Number of Turbines to Monitor:

The number of turbines monitored will follow the guidelines below as per “Standard Mortality Transect Survey”, and will include at least one validation procedure to correct bias. Validation procedures can include, but are limited to the use of nets, the use of dogs, thermal imaging, or night optical device. Monitored turbines shall be identified in consultation between the parties and based upon pre-determined bat and bird risk assessment. A minimum of 10 turbines will be sampled, or a maximum of 20% of the turbines in the project area (whichever is greater). If the project contains less than 10 turbines, all turbines in the project area will be sampled unless otherwise agreed to by the Commission.

III. Mortality Monitoring Procedure

Carcass removal and searcher efficiency trials will be performed, and the duration, frequency and number of turbines to monitor are the same.

At each turbine to be monitored, a rectangular plot that is 120 meters by 120 meters will be centered on the turbine. Although evidence suggests that > 80% of the bat fatalities fall within ½ the maximum distance of turbine height to ground (Erickson 2003a,b) search areas vary and often do not allow surveys to consistently extend to this distance. Therefore, the searchable area underneath turbines will be delineated and mapped, and estimates of mortality will be produced. Maps are to be constructed illustrating all turbine locations, a designated numbering system for turbines, 120 meter plot, boundaries of survey areas, and searchable areas (broken down into visibility classes and transect numbering if performing standard transect surveys).

- 1) Times spent surveying each turbine should be recorded daily and remain consistent.
- 2) All information gathered (i.e. specimen location, species, transect/net grid number, etc.) should be entered on data sheets provided. Any mortality that occurs to state listed endangered or threatened species should be reported to the PGC within 72 hours.
- 3) Any large mortality events (> 50 total animals) or mortality of any eagle, or threatened or endangered species that occur outside of the survey periods are to be reported to the PGC within 72 hours.
- 4) Separate data sheets will be used for each date of survey completed. All carcasses are to be picked up and bagged upon discovery. They are to be identified, handled, and labeled properly, in accordance with the special use permit, with the date, turbine number, transect number, and unique specimen number.
- 5) All specimens located should have an azimuth **from** tower and distance to turbine, and recorded on data sheet. It is appropriate to use a numbered flag for each specimen and record distance and azimuth upon completion of transect searches, so long as flags are removed after each day/turbine.
- 6) All carcasses are to be properly identified, labeled, frozen daily, and submitted with data sheets every 2 months to the local regional office of the PGC.
- 7) A summary report of this monitoring, including all data sheets and maps are to be submitted with the annual reports (due December 31) until monitoring is complete. A complete set of post-

construction bat mortality data sheets, all acoustic data sheets with passes/hour, species identification charts, etc. should be included.

Standard Mortality Transect Surveys:

The basis for the methods to be followed for this procedure are set forth by Erickson 2003a, 2003b, Bats and Wind Energy Cooperative 2005 final report, and Kerns and Kerlinger 2004. Areas defined for surveys should be mapped and depict not only prominent structures and area, but in addition to previous studies, label search areas into 1 of 4 visibility classes. All visibility classes represented should be included in the map and proportion of each noted in report. Each visibility class will be equally tested with a minimum of 200 trials using carcasses returned by the PGC.

Visibility Classes: Each turbine will have the vegetation in the searchable area defined into one of the following 4 classes and mapped for submission.

Class 1 (easy): Bare ground 90% or greater; all ground cover sparse and 6 inches or less in height (i.e. gravel pad or dirt road).

Class 2 (moderate): Bare ground 25% or greater; all ground cover 6 inches or less in height and mostly sparse.

Class 3 (difficult): Bare ground 25% or less; 25% or less of ground cover over 12 inches in height.

Class 4 (very difficult): Little or no bare ground; more than 25% of ground cover over 12 inches in height.

- 1) Following the establishment of searchable areas, the breakdown of this area into visibility classes, and mapping of each turbine, transects should be established at no greater than 6 meters apart and marked every 10 meters.

- 2) Each transect will be walked with $\frac{1}{2}$ of the distance between transects equal to the distance on each side to be examined by the searcher.
- 3) As transects are searched, carcasses should be bagged and labeled properly (date, turbine number, transect number, carcass number) and a numbered flag placed in their place. At completion of each turbine, the distance and bearing from each turbine should be recorded and then all flags removed.
- 4) Searches will be abandoned if severe weather is present, and continue if it clears. The time spent searching at all turbines will be recorded and should be consistent.

V. Validation Guidelines

Performing carcass removal by scavenger and searcher efficiency are the standard methods performed together to correct for biases in data collection. Below are accepted techniques to perform this correction. However, please note the PGC will consider alternative methods of validation, to include but not limiting to the use of dogs, thermal imaging, night optical devices etc.

Carcass Removal Trials

Because there are numerous variables that may make every turbine unique, we suggest placing an equal number of carcasses per turbine to be monitored for removal by scavengers. Additionally, all 4-visibility classes should have an equal sample size. A random bearing and distance from the turbine should be selected to determine placement of the carcass. For these trials, carcasses must be placed within the surveyed area underneath turbines after sunset and under darkness, and monitored for removal every 12 hours. Ideally, the total number of bird and bat carcasses used should be representative of the actual size and species of killed animals, with no less than 50 specimens monitored per year. These trials should be performed periodically throughout each monitoring session. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction and have its location recorded. Records shall include the turbine number, a brief

description of immediate vegetation that may impede visibility, classification using one of the 4 visibility classes described above, and length of time before removal.

VI. Searcher Efficiency Trials

To produce the best estimates of mortality, a high number of searcher efficiency trials will be performed. A minimum of 200 individual trials will be performed to test searchers. The carcasses will be toe clipped to identify and number them. Carcasses missed by searchers will be picked up after their survey is complete and will be used again. Because a number of samples will be collected from all dead bats, each carcass recovered will be submitted to the PGC and the appropriate number needed for testing will be returned. The habitat surrounding turbines may vary considerably and searcher efficiency appears highly correlated to visibility and habitat types. Therefore, the search area defined for each turbine surveyed will be divided into the 4 visibility classes (illustrated on map). An equal number of carcasses will be placed in each visibility class, and will be placed at a random azimuth and distance. Each turbine monitored by searchers should be examined, with an equal number of carcasses placed at each turbine.

Testing should occur sporadically throughout monitoring periods and searchers should not be made aware they are being tested. An effort should be made to test searchers equally during both inclement and good weather, with weather conditions recorded. Carcasses placed should be representative of the percentage and number of species found during the mortality monitoring, and should replicate the manner in which the majority of bats are found in that visibility class (i.e. crawled under vegetation). An effort to maximize the number of carcasses placed is best, with no less than 200 per year.

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Section 1 - Cover

IV. WIND FARM PERMITTEE
V. POST-CONSTRUCTION BAT MORTALITY SURVEY
REPORT

Permit Number _____

Project
Name: _____

Company/
Organization/
Permittee Name: _____

Address: _____

Phone: (_____) _____ - _____ Fax: (_____) _____ - _____

E-Mail: _____

Project Supervisor
Name: _____

Supervisor Contact: Phone: (_____) _____ - _____

E-Mail: _____

If this is contracted work, provide the name & address of the
individual/organization work is being performed for:

02/05

Pennsylvania Game Commission

Description of Wind Turbine Searched for Carcasses

Project Name: _____ **Turbine Number:** _____

1. Diameter of Blade Span: _____m **Number of Blades:** _____

2. Blade Height Above Ground- Max.: _____m;
Min.: _____m

3. Surface Area of Search Plot: _____m²

4. Attach map of each turbine with 120 meter plot, search boundaries, location and numbering of transects/area covered by nets, and vegetation classification if applicable on separate sheet.

5. Attach a spreadsheet with weather data collected at 10-minute intervals. Data should include wind speed, temperature, precipitation, cloud ceiling height, and height and altitude of monitoring device.

6. General Habitat Description and Topography within 100 m of Turbine:

7. General Habitat Description and Topography >100m from Turbine:

Daily Search Summary

Page: _____ of _____

Project Name: _____ (*complete each day of search*)

Pennsylvania Game Commission Wind Energy Voluntary Cooperative Agreement Cooperators

Updated February 13, 2013

	Company	Date Signed
1	AES	4/18/2007
2	E.ON Climate & Renewables N.A. (formerly Airtricity)	4/18/2007
3	Competitive Power Ventures, Inc.	4/18/2007
4	Energy Unlimited, Inc.	4/18/2007
5	Freedom Wind Energy, LLC	4/18/2007
6	Gamesa Energy USA	4/18/2007
7	Iberdrola Renewable Energies USA	4/18/2007
8	PPM Atlantic Renewable/Iberdrola	4/18/2007
9	ReEnergy, LLC	4/18/2007
10	First Wind (formerly UPC Wind Mgmt)	4/18/2007
11	US Wind Force, LLC	4/18/2007
12	Acconia Wind Energy USA, LLC	8/20/2007
13	Global Winds Harvest, Inc.	8/20/2007
14	Penn Wind	9/28/2007
15	Laurel Hill Wind Energy, LLC	1/8/2008
16	AMP-Ohio / MESA	2/15/2008
17	Everpower Renewables	2/1/2008
18	Forward Windpower, LLC	3/21/2008
19	Lookout Windpower, LLC	3/21/2008
20	BP Alternative Energy	6/24/2008
21	Wind Park Bear Creek, LLC	4/3/2009
22	Invenegy Wind Development LLC	6/1/2009
23	Tuthill Corporation Dba Blue Mountain Ski Area	12/18/2009
24	PPL Renewable Energy LLC	12/29/2009
25	New Tech Wind Inc	12/30/2009
26	Duke Energy	2/16/2010
27	Apex Wind Energy Holdings LLC	3/10/2010
28	Allegheny Ridge Wind Farm LLC	6/3/2010
29	Volkswind USA, Inc.	7/20/2010
30	enXco	2/8/2011
31	Stony Creek Wind Farm LLC	8/3/2011
32	Seldom Seen Wind LLC	8/26/2011
33	North East Wind I, LLC	2/25/2012
34	Buck Mountain Wind Energy LLC	2/4/2013
35	Tihali Wind Turbines LLC	6/13/2013