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
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[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.

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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**		
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[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	
Code	Sky condition indicator
0	Clear or a few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy (broken) or overcast
4	Fog or smoke
5	Drizzle
7	Snow
8	Showers

Wind Speed Codes (Beaufort Scale)	
Code	Wind Speed Indicators
0	Smoke rises vertically (< 1 mph, <2 kph)
1	Wind direction shown by wind drift (1-3 mph, 2-5 kph)
2	Wind felt on face; leaves rustle (4-7 mph, 6-12 kph)
3	Leaves, small twigs in constant motion (9-12 mph, 20-29 kph)
4	Dust rises; small branches move (13-18 mph, 20 – 29 kph)
5	Small trees in leaf begin to sway (19-24 mph, 30-38 kph)

Pennsylvania Breeding Bird Atlas Breeding Codes (BC)

For further explanations of BCs, Safe Dates, and other Breeding Bird Information, see the website of the 2nd Pennsylvania Breeding Bird Atlas

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

FORM Wind-70008-PCL-1
10/06

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

Point Count Locations at this Project.
Provide Lat/Lon coordinates in Degrees, Minutes & Second (DMS) format.
And datum used (NAD27 Preferred)

Project Name:________________________________ Page: _____ of _______

Total Number of Points:________

Lat/Lon GPS Location Information (DMS) for All Points

DATUM used:

Point No.	Latitude			Longitude			Habitat:
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Use additional pages if necessary

Pennsylvania Bird Survey Area Search Form			
Site:	Observer:		Date:
Area:	Assistant:		Start time:
Sky:	Wind:	Temp:	Stop time:

Species Code	Breeding Code / Behavior Notes [a]	Habitat	GPS Location Data (NAD 27)					
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[a] Use Breeding Codes recommended for point counts. Also note if an audio-lure (tape-playback) was used to attract the bird observed.

Additional Notes on Survey:

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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