State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation

AGENCY OF NATURAL RESOURCES
103 South Main Street
Center Building
Waterbury, Vermont 05671-0301

TO: All Interested Parties

FROM: John Sayles, Director of Policy, Planning, and Research

DATE: April 20, 2006

RE: ANR's draft *Guidelines for the Review and Evaluation of Potential Natural Resources Impacts from Utility-Scale Wind Energy Facilities in Vermont*

Today, the Vermont Agency of Natural Resources is releasing draft *Guidelines for the Review and Evaluation of Potential Natural Resources Impacts from Utility-Scale Wind Energy Facilities in Vermont* for public comment. These guidelines are intended to:

- Establish Agency guidelines for reviewing proposals and applications for Certificates of Public Good (CPGs), pursuant to 30 V.S.A §248, and for providing testimony before the Public Service Board related to the development of utility-scale wind energy facilities.
- Describe data the Agency will request in order to develop testimony and provide recommendations to the Public Service Board, as well as to review permit applications for aspects of proposed projects subject to separate Agency permitting authority. To accomplish this, the Agency provides a detailed outline of expectations for pre- and post-construction data collection and general guidelines for construction, operation, and maintenance of utility-scale wind facilities.

The guidelines are designed to ensure consistency in Agency evaluation and to provide transparency in our process to applicants, intervenors and others, but are not legally binding to applicants, intervenors, others or the Agency.

The comment period on the draft guidelines will end at close of business on June 30, 2006. The Agency anticipates preparing a responsiveness summary and revised version of the guidelines after the close of the comment period. The Agency anticipates that these guidelines, and the process derived from them, will also be periodically revised and adjusted based on the available science and information that is pertinent and applicable to the state and the region.

An electronic copy of the guidelines, as well as of this notice of public comment, will be available on the Agency's website (http://www.anr.state.vt.us/site/html/RMAR.htm). To obtain a hardcopy of the draft guidelines, or for questions regarding this document, please contact Julie Moore at (802)241-3687 or julie.moore@state.vt.us.

DRAFT

Agency of Natural Resources

Guidelines for the Review and Evaluation of Potential Natural Resources Impacts from Utility-Scale Wind Energy Facilities in Vermont

I. Purpose

- The purpose of these guidelines is to establish an Agency process for reviewing proposals and applications for Certificates of Public Good (CPGs), pursuant to 30 V.S.A. §248, and for providing testimony before the Public Service Board related to the development of utility-scale wind energy facilities.
- The Agency is a statutory party under Section 248, which requires that the project will not have an undue adverse impact on aesthetics, historic sites, air and water purity, the natural environment and the public health and safety, and give due consideration to the criteria in 10 V.S.A. §1424a(d) and §6086(a)(1) through (8) and (9)(K) before issuing a CPG.
- The Agency needs specific data to develop testimony and provide recommendations to the Public Service Board, as well as to review permit applications for aspects of proposed projects subject to separate Agency permitting authority. To accomplish this, the Agency provides herein a detailed outline of expectations for pre- and post-construction data collection as well as general guidelines for construction, operation, and maintenance of utility-scale wind facilities. Applicants should contact the Agency in advance of collecting any data or commencing any studies related to a proposed wind project in order to ensure that such activities are designed and conducted in such a manner as to be useful to the Agency in evaluating the project.
- Although these guidelines, and the process derived from them, are non-binding, they reflect the current thinking of the Agency. These guidelines will be revised and adjusted based on available science and information that is pertinent and applicable to the state and the region.

II. Process

ANR's process for reviewing utility-scale wind projects involves a number of steps, some of which ideally begin well in advance of any application to the Public Service Board. Regardless of the current status of any project, however, the Agency encourages all developers to review the process that follows, identify the current status of their project, and work with the Agency to implement these guidelines from this point forward. In addition, ANR is available to meet with interested parties who have requested ANR information or assistance throughout the process.

ANR will be involved throughout the process described below, with specific involvement in Steps 1, 2, 3, 5, and 8.

Step 1: Scoping Meeting with ANR

- The location and scope of the project need only be defined conceptually in advance of initiating this process with ANR

- Scoping meeting involves Agency "wind scoping" team, who will define data needs related to the project
    - Scoping meeting will focus on components of the initial resource assessment (Step 2), as well as timing for pre-construction bird/bat surveys

Step 2: Initial Resource Assessment

- The applicant assembles existing baseline information in narrative and mapped forms, as appropriate, for natural resource features within the proposed development as well as access corridors and areas adjacent to the development that are reasonably likely to be affected by the project, including:
    - Site analysis (see Appendix A)
        - Delineate areas that may be especially vulnerable; site characteristics of particular concern are:
            - Water resource features
            - Ravines or gullies
            - Highly or moderately erodable soils
            - Slopes in excess of 20%
            - Existing structures or roads within 1000 feet of a proposed turbine location
    - Wildlife habitat inventory, including an evaluation of bird and bat migratory activity (see Appendix B)
    - Rare, threatened, and endangered species and significant natural communities inventory
        - The Vermont Fish and Wildlife Department (FWD) maintains a database of rare species and state-significant natural communities; detailed information about particular species or natural communities can be obtained by consulting the FWD Nongame and Natural Heritage Program.
    - Aesthetics
        - Identify significant viewsheds, giving particular consideration to views from publicly held land, hiking trails, highways, and recreational resources including rivers, lakes, and ponds
        - Describe specific measures that will be used to mitigate visual impacts of nighttime lighting (e.g., baffling/shielding, LED vs. incandescent fixtures)
- ***Note:*** some of these assessments are time-sensitive; for example, data regarding migratory bats and birds must be collected during specific times of the year

Step 3: ANR Consultation Process

- ANR identifies project coordinator and establishes Agency team
    - Team consists of stream and water quality experts; wetlands staff; wildlife and fisheries biologists; stormwater staff; attorney(s).
- Applicant submits a conceptual design of the proposed project on the resource base map (completed in Step 2), including access roads and expected cleared areas (see Appendix A)

- Applicant and ANR team review base map together to prepare for site inspection
- ANR contacts other potentially interested state agencies such as the Department of Public Service, Agency of Transportation and Division of Historic Preservation for comments
- Permit Specialist reviews materials for other required state permits (e.g., Labor and Industry)
- ANR team conducts site visit with applicant
- ANR team reviews initial resource assessment with project layout and works with the applicant to identify potential indirect and direct impacts on natural resources and means of addressing potential impacts
- ANR team provides guidance regarding the scope and study protocol of pre-construction studies and identifies ANR permits that may be applicable
    - The applicant submits study protocols to ANR for review and feedback, prior to commencement of the applicable studies in order to ensure that these efforts are designed and conducted in such a manner as to be useful to the Agency in evaluating the project

Step 4: Pre-construction Studies and Land Management Plan Development

- Pre-construction wildlife studies should include:
    - Radar and acoustical surveys to develop an understanding of bird and bat activity and migration characteristics
    - Evaluation of the presence of rare, threatened, and endangered species and associated habitat(s) (e.g., Bicknell's thrush)
    - An analysis of suitable habitat for the small-footed bat (*Myotis leibii*) and Indiana bat (*Myotis sodalist*), which are included on Vermont's list of threatened and endangered species (see Appendix B)
    - Resident avian and breeding bird survey
    - Diurnal migratory raptor survey
    - Necessary wildlife habitat surveys, including:
        - Black bear feeding areas
        - Deer winter habitat survey
        - Wildlife travel corridors
    - Moose winter habitat survey
    - Identification of wetlands that support significant or unique wildlife functions and values
- Land management plan should include (see Appendix A):
    - Site location map
    - Existing site conditions map
    - Grading and drainage plans
    - Public access control measures to limit human activity and disturbance of the site, as appropriate
    - Habitat restoration management plan
    - Reclamation plan

Step 5: ANR Review

- ANR team reviews all surveys, inventories, and studies conducted in Step 4
    - ANR team meets with the applicant to discuss revisions, if any, to proposed project and/or the need for mitigation
    - ANR evaluates the need for continuation of pre-construction studies during construction
        - Most likely to occur when additional radar and/or acoustical surveys are needed to enhance site-specific understanding of bird and bat activity
- ANR coordinates with DPS
- ANR team meets internally to identify any issues that will be presented in §248 process as part of one or more of the following: prefiling testimony and exhibits from Agency staff and outside experts, reviewing and responding to testimony provided by other parties, and filing briefs on the substantive criteria that the Agency reviews.
    - The ecological significance and fragility of high altitude ecosystems may result in Agency recommendations or testimony that a site is unsuitable for any development even with the use of these guidelines

Step 6: Construction

- ANR may recommend that an independent engineer be retained (at the applicant's expense) to oversee construction, in particular with regard to erosion prevention, and protection of water quality and habitat
- ANR evaluates the need for a turbidity monitoring plan, similar to that required for projects with individual stormwater construction permits, on a case-by-case basis

Step 7: Post-construction

- Post-construction studies are likely to include:
    - Bird and bat surveys, using one or more of the following techniques:
        - Mortality evaluation, including scavenging rate and searcher efficiency control tests
        - Radar
        - Acoustical
        - Thermal imaging
    - Habitat fragmentation impact assessment
        - Black bear
        - Bicknell's thrush and other nesting birds
- Operational protocols (see Section IV)
- Role of adaptive management
    - It is anticipated that these guidelines, and the process derived from them, will be revised and adjusted based on the best available science and information that is pertinent and applicable to the site and/or region as it becomes available

Step 8: On-going ANR Review and Consultation

- ANR reviews all post-construction studies and periodically meets with project personnel (formerly "applicant") to discuss results and possible implications
    - Formal post-construction monitoring is anticipated to last a minimum of three to five years
    - If impacts from the project are found to have an undue adverse impact on wildlife or wildlife habitat, additional or longer-term monitoring and/or operational changes may be necessary
- ANR expects that with 24-hour advance notice, and without additional insurance, licenses, releases, etc., Agency staff or their designated officials may access the project site throughout the life of the project
    - ANR may conduct its own additional post-construction monitoring on-site in order to advance its knowledge about the impacts of utility-scale wind development and to assist in ensuring compliance with applicable terms and conditions of the CPG and other relevant permits.

Step 9: Decommissioning

- The Department of Public Service (DPS) addresses when and under what circumstances decommissioning will occur, and the need for and size of a decommissioning fund to restore the project site
- ANR reviews site restoration plans, including:
    - Description of the anticipated manner in which the project will be decommissioned
        - Removal of above ground equipment and turbine foundations
    - Appropriate activities to restore project area and access routes to a "natural" condition, consistent with the location
        - Native vegetation and local ecotypes should be used to revegetate turbine sites and roads
        - Restoring drainage patterns
        - Removing culverts and bridges
    - Monitoring and control plan for invasive plant species, anticipated to last five years

III. Procedures and Permits

This section of the guidelines broadly establishes parameters for and defines the extent of studies needed to document impacts associated with project implementation. Developers of utility-scale wind projects will need to review the individual requirements of the procedures and permits described herein to determine applicability in view of site-specific considerations (such as: species present, scope of the project, existing access). ANR recommends all relevant permits be applied for, and if possible obtained, prior to the applicant filing its petition for a Certificate of Public Good (CPG). The applicant should prepare a comprehensive report or reports covering the items described below for review by ANR and for use in the PSB-process. ANR expects that the applicant will engage qualified consultants to complete these assessments.

- Wildlife
  - Use the Vermont Fish and Wildlife Department *Guidelines for the Evaluation and Mitigation of Impacts to Wildlife Associated with Energy Development in Vermont* (Appendix B) to describe how the proposed project has been designed to avoid undue adverse impacts on the following:
    - Habitat including, but not limited to: wildlife travel corridors, black bear feeding areas; moose wintering areas; and rare, threatened or endangered species habitat
    - Birds and bats, including potential conflicts with: migrant species, resident species, raptors, and rare, threatened or endangered species
    - Plants, including: significant natural communities, and rare, threatened or endangered species
  - The applicant's chosen consultant should also consult with appropriate local experts, natural resource organizations, and regulatory entities, such as the Vermont Fish and Wildlife Department, the U.S. Fish and Wildlife Service, as well as the Vermont Institute of Natural Science (VINS), which may have applicable expertise regarding a specific species, habitat, or natural community.
- Water quality
  - In general, development of utility-scale wind projects will occur in headwater areas (above 1,500 feet elevation) and possibly Class A(1) watersheds (above 2,500 feet elevation); these waters are considered sensitive resources and as such are afforded extra attention in the Vermont statues. It is particularly important that projects in these areas meet all applicable regulations, described below.
  - Stormwater
    - Estimate the total acreage that will be disturbed during construction, the maximum area that will be "open" at any one time, and the proposed area of impervious surface (e.g., gravel or paved access roads, parking areas, roof area)
      - The smallest practical area of land should be exposed for the shortest practical time during development.
      - The amount of vegetation removed should be the minimum necessary to operate equipment.
    - Describe how stormwater runoff will be managed in compliance with the *Vermont Stormwater Management Manual* and *Vermont Standards and Specifications for Erosion Prevention and Sediment Control* (www.vtwaterquality.org/stormwater.htm)
    - Stormwater construction and operating permits should be obtained prior to petitioning for a Certificate of Public Good (CPG) in the §248 process

- Wetlands
  - Indicate how wetlands and the lands adjacent to wetlands, in locations proximate to areas of disturbance, will be maintained in an undisturbed, naturally-vegetated condition
  - A Conditional Use Determination (CUD) will be required for any project impacting Class I or II wetlands, or their buffer
  - The project may also require a permit from the Army Corps of Engineers if more than 3,000 square feet of wetlands (Class I, II, or III) are impacted
- Streams
  - For streams located within or near the project boundary, describe how the stream and the lands along the stream will be maintained in an undisturbed, naturally-vegetated condition
    - See ANR's *Riparian Buffer Guidance*, signed December 9, 2005
  - Describe any work that will take place in a stream (e.g., installing or removing bridges, culverts, or other crossings):
    - Describe how the stream crossing provide for unrestricted aquatic organism passage (contact the District Fisheries Biologist for current guidelines)
    - All stream crossings need to be reviewed by the stream alteration engineer with the Rivers Management Program
    - Any work that will impact a stream is likely to require a permit from the Army Corps of Engineers
- Section 401 Water Quality Certification
  - Under Section 401(a)(1) of the Federal Clean Water Act, Vermont has the authority to review and approve, condition, waive, or deny water quality certification for any activity that is subject to a federal permit or license and may result in a discharge to waters of the United States. Section 401 authority applies, for example, to projects for which a Section 404 Permit from the Army Corps of Engineers is required
  - In Vermont, Section 401 Water Quality Certification applications are reviewed to determine if the activity will comply with the Vermont Water Quality Standards as amended by the Vermont Water Resources Board and any other requirements of state law
  - Permit applications and further information can be obtained from the regional stream alteration engineer with the Rivers Management Program

- Other ANR concerns:
  - Criterion 9(K) in 10 V.S.A. §6086(a) requires review of the effects of the proposed project on both (a) the public investment in the place or service, and (b) the function, efficiency, or safety of the facility, service, or lands; and the public's use, enjoyment, and access of or to the facility or land
  - Air pollution
    - Indicate how dust will be controlled during and after construction

        - If the project will require an on-site concrete batching plant or require diesel generators with a rated capacity of more than 450hp, contact the ANR Air Pollution Control Division at 241-3840 for further direction.
    - Construction waste
        - Indicate how construction debris, including stumps, will be disposed
    - Icing
        - Provide estimates of the following:
            - Average number of icing events per year
            - Total annual duration of icing events
        - Describe strategies that will be implemented to mitigate icing
    - Water supply
        - Estimate how many gallons of water per day will be needed:
            - During construction
            - During operation
        - Describe the source(s) of water which will be utilized on either a temporary or permanent basis for the project and demonstrate that water exists in sufficient quantity for the needs of the project.
- Regulatory concerns outside ANR
    - The applicant should consult with appropriate resource entities and other regulatory agencies which may possess expertise or information regarding the natural resources in existence in the project area, including:
        - U.S. Fish and Wildlife Service
            - Wildlife
        - U.S. Army Corps of Engineers
            - Wetlands
        - Vermont Agency of Transportation
            - Project access
        - Vermont Department of Health
            - Noise
        - Vermont Department of Public Service
            - Aesthetics
                - Role of aesthetic concerns in informing proposed project design
            - Icing
                - Safeguards to prevent human injury or property damage from thrown ice
        - Vermont Division of Historic Preservation

IV. Operational protocols

If post-construction monitoring demonstrates that the project is having an undue adverse impact on the natural environment (for example, exceeding acceptable thresholds for bird/bat mortality as defined in Appendix B) the Agency is likely to seek mitigation. Appropriate mitigative measures will depend on the type and severity of impacts, the most recent research findings concerning causes of impacts, and practicality. A general discussion of common mitigative measures is provided below; additional measures may be considered depending on future research findings.

- Modified Operations. If post-construction monitoring shows unanticipated turbine impacts which result in bird and/or bat mortality rates that exceed the acceptable thresholds established by DFW, the Agency may seek changes to project operation. The Agency expects that operational changes would occur in an iterative matter, and be informed through on-going data collection. Examples of such changes include: additional monitoring or research to understand the identified impacts and possible mitigation strategies; technological improvements; adjustment of operations during periods of highest risk; suspension of operation during periods of highest risk, provided there is good reason to expect that a non-operating turbine will pose less risk than an operating turbine. For example, if impacts were occurring at night during certain periods of fall migration, the applicant may need to modify operation of the turbine(s) during those high-risk nights. If it should become apparent that mitigation is not possible, the Agency may seek to have the facility decommissioned.
- Modified Lighting. Studies have shown that lit structures pose a higher risk to birds than unlit structures. In the event that post-construction monitoring demonstrates that the project is having an undue adverse affect, the applicant may need to evaluate alternative scenarios for aircraft warning lighting, such as reducing the number of turbines with lights, altering the arrangement of lights if not all turbines are lighted, using light emitting diode (LED) or rapid discharge fixtures, or providing baffling around the lights to limit visibility. Any modifications to the lighting strategy employed at the project site would also need to be consistent with the guidelines cited in FAA Advisory Circular 70/7460-1J to the extent those guidelines are required.
- On-Site Habitat Management. The applicant may be asked to consider habitat management measures in the vicinity of the turbines to modify wildlife behavior and reduce the risk of impacts. Such measures would be determined in consultation with the Department of Fish and Wildlife in response to specific concerns or impacts that are related to habitat factors. Examples include, but are not limited to, modifying the type or extent of vegetation cover, forest openings, perching and nesting sites, or cover for prey species.
- Habitat Protection. If measures to avoid or minimize impacts are not practicable, compensatory mitigation measures such as protection or enhancement of wildlife habitat may be appropriate. Any such measures would be reviewed and approved by the Department of Fish and Wildlife.

V. Additional References/Resources

- ANR (FPR) Acceptable Management Practices (AMPs) For Maintaining Water Quality On Logging Jobs In Vermont (August 1987) http://www.vtfpr.org/pdf/waterq.pdf
- ANR (DEC) Guidelines for the Design and Construction of Ski Lifts and Trails in Class A Watersheds in Vermont (August 2000)
- ANR (DFW) Mitigation Guidelines for Black Bear Habitat in Vermont (October 1992)
- ANR Riparian Buffer Guidance (December 2005) http://www.anr.state.vt.us/site/html/buff/BufferGuidanceFINAL-120905.pdf
- ANR (DEC) Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites (2003) http://www.anr.state.vt.us/dec/waterq/stormwater/htm/sw_erosionhandbk.htm
- ANR (DEC) Vermont Stormwater Management Manual (April 2002) http://www.anr.state.vt.us/dec/waterq/stormwater/docs/sw_manual-vol1.pdf
- ANR Wind Energy Group Working Papers (February 2004) http://www.vermontwindpolicy.org/wrkpaprs.html
- Federal Aviation Administration Technical Note – Development of Obstruction Lighting Standards for Wind Turbine Farms DOT/FAA/AR-TN05/50 (November 2005) http://www.tc.faa.gov/its/worldpac/techrpt/artn05-50.pdf
- US Fish and Wildlife Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines (May 2003) http://www.fws.gov/habitatconservation/wind.pdf
- *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont.* Thompson and Sorensen. October 2000.

Appendices

A: Site Analysis and Land Management Plan

B: ANR (FWD) Guidelines for the Evaluation and Mitigation of Impacts to Wildlife Associated with Wind Energy Development in Vermont

Appendix A: Site Analysis and Land Management Plan

Site Analysis

The site analysis should use a combination of text, maps, photographs, and other techniques to accurately describe the project area. The results of the site analysis should be used to show that the planned wind development will result in the least amount of disruption to the site and avoid critical areas.

- Plat map showing physical dimensions of the proposed project area, proposed facilities/structures, land ownership and accurate property lines, and existing development, including buildings and established trail and road systems, within ½-mile radius of project site
- Site location map, based on USGS topographic quadrangle(s) for the area, showing the general location of project features with respect to nearby features including waterbodies, structures, roads, and utilities. Features should include:
    - Areas to be cleared, distinguishing between cutting and grubbing
    - Laydown/staging areas
    - Pad site
    - Accessory generating structures
    - Proposed connections to the electricity grid (e.g., powerlines, substations)
    - Stormwater controls
    - Any quarrying/on-site waste/borrow/off-site storage areas for road construction
    - Other project-related construction
    - Proposed transportation route for equipment and structures within the project site
- Should also include information on alternative sites considered, if any
- Existing conditions site plan, showing specific features of the project at a larger scale (1:100 or larger scale) and in much greater detail than the site location map. Elements recorded include:
    - Existing topographic contours (five foot intervals)
    - Soil types and characteristics (i.e. erodibility factors)
        - Determine the erodibility of the soils in the areas that will be disturbed, typically using results from on-site surveys coupled with information from the U.S.D.A. Soil Conservation Service soil survey. The soil types should be shown on a map which also shows the basic project area, and a narrative describing the soils should accompany the map.
        - If the project is located in an area that does not yet have a detailed soil survey, the applicant should make a reasonable estimate of the erodibility of the soils by field observations, or by utilizing a professional trained and experienced in soils identification to obtain this information.
    - General vegetative cover types (e.g., field, forest – including dominant species, significant rock outcrops)

        - Description of vegetation should identify information that both describes existing unvegetated areas and identifies areas that, after development, may require special erosion control measures
    - Drainage and water features (e.g., streams, springs, seeps, wetlands and forest pools, vernal pools)
- Viewshed
    - Photomontages or other visual simulations showing the appearance of the development in the context of the surrounding area and from key view points
        - Views to and from the site, including views from existing dwellings, major roads, hiking trails and other recreation facilities (e.g., beaches)

Land Management Plan

The land management plan should include the following components:

- Logging history and forest management plan, if applicable.
- Plan for ingress and egress for equipment and structures to project site. A description of the specific access routes should include:
    - All state, county, and/or town-maintained roads
    - New road/access development associated with the project
- Description of new clearing or construction necessary for power line corridors
- Grading criteria for ground preparation, cuts and fills, soil compaction
- Habitat restoration management plan (post-construction)
    - Identify vegetation, soil stabilization, and erosion reduction measures that will be implemented as soon as possible following facility construction activities
        - Develop site-specific requirements for seeding rates, planting densities and species mixes.
        - Specifications for revegetation of laydown areas and access road shoulders including species, timing of planting, and method of planting, as well as nutrient application rates, source and amounts of nutrients and method of application
        - Avoid using equipment for revegetation (read: seeding) that might cause further degradation
    - Develop plan for monitoring and control of noxious weeds and invasive plants, which could occur as a result of surface disturbance activities at the site
        - Plan should include a minimum of five years of monitoring
- Reclamation plan (post-operation)
    - Removal of above ground equipment
    - Landscaping of turbine foundation areas
    - Restoration of project access, as appropriate
        - Revegetating roads
        - Removing bridges, culverts, or other stream crossings

Appendix B: ANR (FWD) Guidelines for the Evaluation and Mitigation of Impacts to Wildlife Associated with Wind Energy Development in Vermont

Section I. Position Statement

The Vermont Fish and Wildlife Department (Department) is primarily responsible for maintaining the state's populations of wildlife and the important cultural, economic and ecological benefits that wildlife provide. As such, the Department is responsible for evaluating potential impacts to fish and wildlife resources as a result of the proposed development of utility-scale wind energy facilities in Vermont.

In general, information on impacts on resident and migratory wildlife resulting from the development and operation of utility-scale wind projects is limited, and even more so for forested regions in the northeastern United States. The Department believes that utility-scale wind projects have the potential to impact the following types wildlife: migratory and resident bat populations, night migrating songbirds, resident (breeding) bird species such as Bicknell's thrush (*Catharus bicknelli*) and other high elevation nesting songbirds, and some wide ranging mammals such as black bear (*Ursus americanus*) and moose (*Alces alces).*

Of particular concern are results from recent scientific work documenting bat fatalities resulting from collisions with wind turbines along forested ridge tops in the Northeast. Specifically, fatality rates exceed those documented in earlier studies in midwest and western states and are high enough to suggest that the impact of utility-scale wind projects on state and regional bat populations could be significant, given the low reproductive rate of bats and Vermont's location at the northern limits of several species' range (e.g., silver-haired bat).

The following points reflect the Department's position regarding potential wildlife impacts. These points, and the procedure derived from them, will be revised and adjusted based on the best available science and information that is pertinent and applicable to the region as it becomes available.

- A cautious approach in reviewing utility-scale wind projects proposed for Vermont ridgelines is necessitated by the dearth of operational utility-scale wind projects in similar environments and the resultant lack of understanding of the associated population and habitat effects on birds, bats and other wildlife.
- Habitat disturbance should be minimized. Existing roads and utility corridors should be utilized to the greatest extent practicable and new access roads and utility corridors should be configured to avoid high quality habitats and minimize habitat fragmentation. Site access roads and utility corridors should also seek alignments that minimize stream crossings and wetland impacts.
- The risk of collision mortality for both resident and migratory bird and bat species should be minimized. The lack of information regarding the characteristics of breeding bird and resident bat activity on ridgelines, and bird and bat migration within this region severely restricts the ability to predict impacts of wind energy projects. Current data needs include information on: the magnitude of migration,

timing of migration and peak migration events, altitudinal distribution of migration, species composition of migrants, and the possible effects of weather and topography on migration and other wildlife behaviors.

- Radar data provides a necessary baseline for assessing potential risks to resident and migrating bird and bat species, and can help inform the proper siting/placement of turbines. Radar data may also have utility in developing post-operational adjustment measures that could be made to a facility to reduce collision mortality, as well as identifying times within which to focus post-construction mortality surveys.
- A minimum of three years of rigorous post-construction bird and bat mortality surveys are necessary for any utility-scale wind project in Vermont so that impacts can be identified, monitored and described. Post-construction monitoring is also necessary to determine the efficacy of any mitigation measures that are implemented. In the long-term, post-construction monitoring data may be useful to correlate bird and bat mortality with pre-construction radar migration data to better predict the risk of collision fatality at wind energy sites in Vermont.
- The Bicknell's thrush requires montane spruce-fir forest for breeding. This natural community type is limited to mountaintop habitat "islands" that may overlap with potential sites for utility-scale wind facilities. In addition to the Department's standard avoidance and mitigation measures, post-construction monitoring of impacts involving habitat loss, fragmentation and disturbance on montane bird populations may be necessary.
- Black bear populations are most sustainable when they have access to large tracts of forested habitat. Within those forests, the Department recognizes and seeks to protect important forested wetlands, travel corridors, and some hard mast producing areas as essential for the species' survival in Vermont. There has been no published research conducted in the Northeast, or elsewhere, on the impacts of utility-scale wind projects on black bears and their habitat. Additional research may be necessary to assess the potential scope and importance of impacts to black bears from utility-scale wind development.

Section II. Pre-Construction Surveys

The construction of a utility-scale wind project may impact wildlife through the reduction, alteration, or fragmentation of habitat. It is therefore of critical importance to establish the presence or absence of different wildlife species and significant habitats, well in advance of any construction activities, so that appropriate mitigation and avoidance practices can be used. Studies conducted at one location can rarely be used to extrapolate potential impacts or mitigation effectiveness at other locations because of differences in site-specific conditions, such as topography, the types and densities of species present, and the type of wind turbines installed.

Before initiating any of the surveys described in the following sections, the applicant is strongly encouraged to contact the Department to discuss the details of survey methods.

1. *Rare, Threatened, and Endangered Species*

The Department tracks the status of native plants and animals that are considered rare, threatened or endangered in Vermont. In general, these species are in jeopardy for one or more of the following reasons: loss of critical habitat(s); some species occur at the edge of their range; vulnerability to disturbance or collection; or other ecological or biological factors such as life histories and slow reproductive rates.

A rare species is one that has only limited population in the state and that faces threats to its continued existence. The Vermont Fish and Wildlife Department uses a ranking system that describes the degree of rarity of a species in Vermont. Species with a state status of Threatened or Endangered are protected by Vermont's Endangered Species Law (10 V.S.A. Chap. 123) and a federal status of Threatened or Endangered are protected by the Federal Endangered Species Act (P.L. 93-205). Currently, there are 28 state endangered and 13 state threatened animals and 63 state endangered and 91 state threatened plants in Vermont.

A. General

The presence or absence of rare, threatened or endangered species is site-specific and the scope of evaluation may vary, with the exception of the evaluation for bats as set forth below. The applicant should engage a qualified consultant(s) to determine the presence or absence of rare, threatened or endangered species. The applicant's consultant(s) must coordinate with the Department regarding assessment of threatened and endangered species. Any and all data related to any state or federal listed threatened or endangered species must be provided to the Department for review. Locations of rare, threatened and endangered species should be mapped using GPS/GIS technology and provided to the Department, as described in Section IV of this procedure. Any habitats that are essential for survival of any identified rare, threatened or endangered species should also be mapped using GPS/GIS technology and provided to the Department.

B. Threatened and Endangered Bats

i. The applicant should undertake an assessment of the distribution of suitable habitat for Vermont's two species of bats that are listed as threatened or endangered pursuant to the Vermont Endangered Species Law, Indiana bat (*Myotis sodalis)* and small-footed bat (*Myotis leibii)*, within a 3 to 5 mile radius of the proposed project site. Summer habitat for these species should be evaluated within 3 miles of the project site and hibernacula should be evaluated within 5 miles of the project site. All assessments of the federally listed Indiana bat or its' habitat must include pre-assessment consultation with the U.S. Fish and Wildlife Service.

ii. Should any proposed project site be within three air miles of suitable habitat for these species or within five miles of any hibernacula containing either of these species, additional and/or more extensive surveys or research (e.g., radio telemetry) may be required to adequately assess their risk of collisions with operating wind turbines at the project site.

2. ***Migrating Birds and Bats***

The focus of pre-construction bird and bat surveys is nocturnal migration over the project site, with the surveys designed to accurately assess the number and elevation of migrating targets. The Department provides the following guidelines for pre-construction migrating bird and bat surveys, but the applicant should work closely with the Department to establish an appropriate sampling design based on site-specific conditions.

A. Radar surveys should be conducted using state-of-the-art marine radar technology operated in a fashion designed to accurately count migrant targets (both birds and bats) during the survey periods. Radar data for migrating birds and bats must be collected using both vertical and horizontal radar operating modes.

B. Mobile marine radar technology (similar to Furuno Model FR1510MK3, 12KW, 72NM, DeTect X10 ESR or similar state-of-the-art technology) should be used to collect data on nocturnal migration and should be operated by qualified and trained radar ornithologists pursuant to a written survey protocol that has been reviewed and approved by the Department.

C. Radar surveys should be designed to collect data to identify the number of targets (birds or bats) flying over the project site per km per hour (passage rate), the number of targets flying over the site by time of day, total number of targets recorded, total number of targets within the rotor swept zone, passage rate of targets relative to altitude, variation in target passage rate, direction of flight, and variation in altitude of flight related to variation in weather.

D. In general, radar surveys should collect data during the periods: April 15 through June 1 and August 1 through October 30. These data are collected for a minimum of one year; it may be necessary to collect an additional year of pre-construction migration data depending on the size of the proposed project, habitat conditions, or results from the first year of survey.

i. Radar units should be operated for a minimum of 20 nights for at least six hours continuously each night beginning at sunset and extending to at least two hours after midnight during the fall sampling period (August 1 to October 30).
ii. Radar units should be operated for a minimum of 15 nights for at least six hours continuously each night beginning at sunset and extending to at least two hours after midnight during the spring sampling period (April 15 – June 1).

E. NEXRAD data from the Burlington International Airport is examined and evaluated for each night when radar assessment is conducted in order to compare site-specific bird migration data to large-scale bird migration events.

F. Observations of bird species at the study site should be conducted each morning following radar sampling to detect the presence of species that may stop-over at the site. Observations should be made based on pre-established transects that provide a representative sample of the project area and all habitat conditions at the site. It is not necessary to make observations over the entire project area.

G. Radar data should be supplemented with acoustic or ceilometer data to identify migrant species. These units need to be designed according to the specifications established by Old Bird, Inc. (www.oldbird.org) and located and operated pursuant to a survey protocol that has been reviewed and approved by the Department. Typically, two avian acoustic units are sufficient to sample most sites. Survey periods should encompass the same sampling periods for radar surveys. Avian acoustic survey reports should include a discussion of the survey methods, criteria for identification of bird calls (call spectrographs).

H. Acoustical monitoring using Anabat systems (Titley Electronics, Inc) is used to survey migratory bat activity.
i. Acoustic monitoring is to be conducted and analyzed by qualified and experienced professionals pursuant to a written survey protocol reviewed and approved by the Department prior to execution.
ii. At least two acoustical monitoring stations need to be installed along the project site to collect information on the species of bats passing over the site. The necessary number of acoustical monitoring stations is determined and described in the survey protocol. The necessary number of stations will be determined based on an evaluation of the number of turbines proposed and the topographic features of the project area. These stations should be designed according to the specifications of the Department, including a minimum of two (2) detector units per stations, and located and operated pursuant to a survey protocol that has been reviewed and pre-approved by the Department.
iii. The individual detector units are placed at two separate heights above the ground, preferably 15 and 30 meters.
iv. Acoustic monitoring should be conducted for two years during the periods April 15 – June 1 and July 1 – September 30.
v. Acoustic survey reports should include a discussion of the survey materials and methods, a description of the pre-approved criteria for identification of bat calls, including all parameters applied for species identification (e.g., minimum frequency and duration of calls).

I. Continuous measurement of air temperature, barometric pressure, wind speed, wind direction, precipitation and cloud cover need to be collected simultaneous to all radar and acoustical monitoring.

3. *Black Bear Habitat*

Little data exists to explain the possible indirect, behavioral impacts of wind energy development to black bears. Existing research of black bear behavior, however, suggests that some bears will avoid or be displaced by the operation and maintenance of wind energy facilities. In particular, wind energy infrastructure located in close proximity to concentrated areas of hard mast trees (e.g., American beech trees) used by black bears, may jeopardize the ability of bears to access and use those habitats. The Department recommends research aimed at better understanding the relationship between the operation of wind energy facilities and black bear behavior. It may be advisable to establish a collectively funded and coordinated research program with the wind energy industry for this purpose. In the absence of new data to this effect, the following procedure applies.

A. All important black bear habitats within ¼-mile radius of proposed turbine sites need to be identified. Surveys include, at a minimum:

- Mapping and tabulating the number of bear-scarred beech and other hard mast species used by bears within 600 feet of either side of the proposed access road.
- Mapping and tabulating the number of bear-scarred beech and other hard mast species used by bears within a 600-foot radius of each proposed turbine site.
- More intensive surveys to delineate the full extent of any concentrations of bear-scarred beech and other hard mast species identified during the mapping efforts described above.
- Representative transects, extending out ¼-mile perpendicular to the access road, at regular intervals, to identify beech or other hard mast stands that may be jeopardized as a result of indirect impacts of the proposed project. The transects should be conducted at a rate of approximately five per mile of turbine string.
- Identifying wetlands within ¼-mile of the project site.
- Identifying potential travel corridors within ¼-mile of the project site.

Survey protocols need to be reviewed and pre-approved by the Department, and consistent with the Department's *Mitigation Guidelines for Black Bear Habitat in Vermont*. Additional information may be necessary to describe the size and character of these habitats depending on the results of the surveys (e.g., degree of recent use by bears, relative regional significance).

B. Projects should be designed to avoid directly impacting or fragmenting any significant black bear habitat features (e.g., bear-scarred beech stands, oak stands, travel corridors and wetlands). These habitat features typically require a ¼-mile

buffer between areas of development and the habitat. Any project-related infrastructure should be sited outside of this buffer zone. If this is not possible, then the impact assessment and mitigation process established in the Department's Black Bear Habitat Mitigation Guidelines should be applied.

C. Black bear habitat survey data should be collected in accordance with the data standards described in Section IV of these guidelines. This data should be provided to the Department for review in a report that summarizes, analyzes and discusses the data and potential impacts to the habitat.

4. *Moose Winter Habitat*

Since many of the locations proposed for wind energy development in Vermont are in high elevation habitats, it is necessary to identify areas used by moose for concentrated winter habitat. These areas within 1/4-mile of the project's access roads should be surveyed and mapped in accordance with the data standards described in Section IV of these guidelines. Projects should be designed to avoid direct impacts to moose winter habitat. Roadways may require special snow plowing efforts to avoid conflicts with moose and vehicles.

5. *Bicknell's Thrush Habitat*

A. All montane spruce-fir forest at elevations above 2,700 feet need to be mapped in accordance with the data standards described in Section IV of these guidelines. A GIS layer of montane spruce-fir forest is available from the Department's Nongame and Natural Heritage Program. This data layer should be used as a general guide and reference when designing site-specific habitat mapping efforts.

B. Detailed mapping of areas of dense spruce-fir forest should be conducted prior to planning tower locations, access roads and other site development that is proposed to occur within the montane forest zone.

C. The applicant should contact the Department to determine if there are records of Bicknell's Thrush at the site. If there are no records of Bicknell's Thrush and there is appropriate habitat, a survey is conducted to determine if this species is present.

   i. If the project is sited in an area that may have one or more pairs of nesting Bicknell's Thrush, the Department may require a detailed field study to determine the estimated population size and any potential impacts.

   ii. A more detailed study includes the use of mist nets and radio transmitters to determine number of nesting pairs, locations of nests and home ranges, local movements and nesting success.

D. The Department maintains a no net loss policy for Bicknell's thrush habitat given the isolated nature and limited distribution of this critical habitat type. Temporary openings that are used to construct wind towers and then allowed to grow back to spruce-fir may be determined to result in no habitat loss if measures are taken to insure rapid re-vegetation.

6. *Breeding Birds*

A. Breeding bird surveys conducted during the period June 1 through July 1 for at least one year prior to project construction. The survey should systematically cover the entire study area and include either:

- Transect surveys spaced between 50 and 100 m apart, or
- Time-constrained searches within discrete plots.

During the surveys, observers will record the presence of all birds encountered, along with documenting any breeding behaviors or activities according to the criteria utilized by the Vermont Breeding Bird Atlas (2003-2007). While the survey may include point counts on a grid, all birds that are observed between points are recorded. For rare species, bird specific searches may need to be conducted to better document breeding potential. While the survey will be coordinated with the Department, a comprehensive methodology for conducting bird surveys is discussed in Bibby *et al* (1998).

B. Results from breeding bird surveys need to be provided in a report to the Department that lists the species observed, heard or otherwise detected, describes and identifies on a GIS map the location of the survey area(s), describes the habitat conditions and the breeding bird species associated with the various habitat conditions, and any notes specifically concerning the presence, behavior, and location of any rare, threatened or endangered species (both state and federally listed species).

C. The applicant also completes an assessment of potential impacts to breeding birds and their habitat and reproductive success at the proposed project site. Specifically, the assessment should consider potential impacts to breeding birds associated with forest and habitat fragmentation that may result from the construction of the project.

Section III. Post-Construction Surveys

Post-construction surveys are needed to understand and document the impacts that utility-scale wind projects will have on wildlife. These data are essential for both identifying potential measures to mitigate the impact of operations at existing sites as well as assessing potential risks associated with future developments. More information on the mitigation process that the Department will employ is provided in Section VI of these guidelines.

Before initiating any of the surveys described in the following sections, the applicant is strongly encouraged to contact the Department for its review and approval of survey methods and reporting.. The applicant may need to demonstrate its ability to fund and carry out such post-construction surveys; this may require the establishment of an escrow account.

The Department believes it is essential to maintain a high level of professional objectivity in the collection, analysis and reporting of any post-construction monitoring data. Therefore, it is the Department's considered opinion that all permits issued for wind energy facilities in the State of Vermont should require the Permittee to establish an escrow fund to support the necessary post-construction monitoring. This fund will be used by the Department, in coordination with the Permittee, to contract and pay for all necessary post-construction monitoring. The Department will, in coordination with the Permittee, select the person(s), group or organization to conduct the surveys, supervise, in coordination with the Permittee, the person(s) conducting the surveys, and receive, review and approve of all data and reports related to the surveys simultaneously with the Permittee.

1. Bird and Bat Mortality

Post-construction monitoring of bird and bat mortality is conducted for a minimum of three years following initiation of project operation for the period April 15 to October 31, and include both scavenging rate control tests and searcher efficiency control tests. The Department reviews and approves all post-construction survey methods and techniques prior to inception of any data collection activities. The survey protocol may be refined during implementation, but includes the following:

A. Bird and Bat Mortality Surveys

i. The applicant employs "state-of-the-art" bird and bat mortality survey methods and techniques that have proven effective at other wind energy facilities in the eastern United States (see Arnett 2005).

ii. The applicant works with the Department to establish a sampling design that will result in data collection with sufficient frequency at a statistically valid sample of turbine locations within the project. A systematic random sampling scheme is needed to provide interspersion of sampling efforts among habitat conditions, physical characteristics of turbine locations, and other site specific variables (Arnett 2005). The Department believes that sample design and the statistical analysis of sample data will benefit from the assistance or review of a trained statistician.

iii. Bird and bat mortality surveys need to be conducted by qualified biologists/technicians that are experienced and trained in conducting surveys of this type.

iv. Air temperature, wind speed, wind direction, barometric pressure, precipitation, and cloud cover conditions are continuously measured and recorded during each day of surveying. Searches should be made following any significant weather events (e.g., cold fronts, strong north or south winds, periods of fog and precipitation) to assess the effects of environmental variables on collision rate.

v. All bird and bat carcasses need to be collected and identified by a qualified professional. All bat specimens need to be properly stored and made available for the collection of genetic and stable isotope analysis. Prior to commencing any bird or bat mortality surveys, it is necessary to secure

permits for the collection and possession of bird and bat carcasses from the Department.

vi. All bird and bat carcasses and carcass parts are collected and secured in sealed plastic bags with a copy of the data collection form and then stored in a freezer. These carcasses must be made available to the Department for record keeping, proper scientific handling and necropsy, if necessary. Each carcass or casualty must be assigned an individual identification number. Data includes, at a minimum: species, sex, age, location, date and time observed, conditions of location, condition of carcass (intact, scavenged, feather spot), and any comments related to the observation. Photo documentation may be an acceptable alternative for collection of field verification for feather spots or other carcass remains that are minimal in nature.

vii. All locations of bird and bat carcasses need to be located using GPS technology and mapped in GIS format, consistent with the data standards presented in Section IV of these guidelines. These results are made available to the Department along with a written report detailing the results of the survey for each survey period. Reports are delivered to the department no later than 20 days following the end of the sampling period. The Department needs to be provided with weekly updates of survey results during the sampling period.

viii. Any casualties or carcasses observed outside of sampling as, or at times when sampling is not scheduled are recorded in similar fashion as described above, included in the database, included in the analysis for each season, and described in the report as such.

ix. Any injured birds, bats or other wildlife located at the facility must be immediately reported to the Department, carefully captured, properly contained and transported to a licensed wildlife rehabilitator.

B. Threatened and Endangered Bats

i. Should either suitable summer habitat for Indiana or small-footed bats be identified within 3 miles of the project site or a hibernacula is identified within 5 miles of the project site for the Indiana bat or the small-footed bat , then post-construction mortality surveys may need to be extended beyond three years.

ii. If suitable summer habitat or hibernacula are identified in accordance with B(i) then the Department may require post-construction mortality surveys during the month of June.

C. Scavenging Rate Control Tests

i. A scavenging rate control test is conducted for each of the three post-operation assessment years using dead bats and birds to estimate the rate of carcass removal by scavenging animals. Fresh bats and birds should be used first, then frozen bats and birds if fresh animals are not available. Correction factors may need to be applied to each sample type.

ii. Should year one surveys demonstrate that scavenging rates are low on the project site, year two and three post-construction mortality surveys may be adjusted to allow for sampling on a less frequent basis.

iii. All protocols should be designed to be consistent with the methods and techniques that have proven effective at other wind energy facilities in the eastern United States (see Arnett 2005).

iv. Scavenging rate tests for birds during the first year of post-construction monitoring need to be conducted at least twice during the survey period (once in May and once in September) to simulate seasonal variations in conditions that could affect scavenging rates. Scavenging rate tests for birds in subsequent years may be reduced to one season (e.g., September) based on the results of the first year tests.

v. Scavenging rate tests for bats are conducted for each year of post-construction monitoring during the period July 15 through August 15.

D. Searcher Efficiency Rate Control Tests

i. A searcher efficiency control test is conducted each year and/or for each set of searchers employed, including a dog if the latter is used. Where habitat visibility conditions on site are poor, the use of trained dogs is recommended to increase searcher efficiency rates.

ii. Searcher efficiency tests should be consistent with the methods and techniques that have proven effective at other wind energy facilities in the eastern United States (see Arnett 2005).

iii. At a minimum, bird and bat carcasses shall be obtained, pursuant to all necessary state and federal collection permits that represent those species or groups of species likely to be encountered at the site. It is recommended that at least two size classes of bird carcasses be used for this purpose.

iv. Carcasses must be randomly distributed in various positions on the ground and in various habitat and cover conditions. Most of the sites in Vermont proposed for wind energy development are located on high elevation ridgelines that are predominantly montane spruce-fir forest. These conditions are likely to prevent some bird and/or bat carcasses from reaching ground level. This condition should be simulated during the searcher efficiency tests.

v. Searcher efficiency tests need to be conducted in accordance with the requirements of C (iv) and (v) for scavenger rate testing described above.

2. *Black Bear Habitat*

If a wind energy project is constructed within ¼-mile of a significant hard mast habitat area (e.g., concentrated area of bear-scarred American beech trees) used by black bear, the following monitoring regime should be initiated by the developer. The Department will revise and adjust this regime based on the best available science and information that is pertinent and applicable to the region as it becomes available. These monitoring provisions are provided as part of the Department's mitigation review process for addressing unavoidable impacts to necessary wildlife habitat for wind energy facilities. Results from these surveys will be used to assess the full extent of indirect impacts to important black bear feeding habitat.

A. Individual bear clawed hard mast trees that are part of a significant bear mast habitat area where any part of the delineated habitat is within 1/4-mile of the developed facility are tagged and numbered under protocols approved by the Department.
B. Tagged trees are monitored every other year, and after each year of good nut beech nut or acorn production, for bear climbing, nut production, and nut viability. Sampling occurs after November 21st. Surveys must account for no less than 3 years of good mast production. Due to the cyclical nature of nut production by beech and oak trees, this monitoring may last up to 8 – 10 years.
C. Surveyors search for and collect bear scat samples within the area being sampled for mast production and bear use. Scat samples are stored in sealed plastic containers, labeled with date, location, and collector's name and refrigerated. Scat samples are sent for DNA analysis at the conclusion of the fall survey period. Surveys need to be conducted for a minimum of three years following initiation of project operation.
D. Mast monitoring data and bear scat/DNA analysis data is provided to the Department annually. A report should be prepared that discusses methods and techniques employed, time of sampling, weather and environmental conditions during sampling, analysis of the data, and a GIS map illustrating the area sampled, the stratified sampling arrangement, location of trees sampled, and annual results of sampling.

3. ***Bicknell's Thrush***
If tower siting is determined to be in an area with one or more breeding females, a post-construction study of the population may be needed to determine the nesting success of Bicknell's Thrush, especially in vicinity of the towers. This study may necessitate mist netting, use of radio transmitters or other field techniques.

4. ***Moose***
If moose wintering habitat occurs within the vicinity of the wind project then post-construction surveys may be needed to document any changes in use of the habitat that may occur due to the project's impacts on the moose. Any documented use by moose of the projects roads may necessitate the creation of moose "plowouts" that allow moose to exit roads during the winter when high snow berms may otherwise cause moose to expend critical energy reserves running up and down the roads ahead of vehicles.

Section IV. Data Standards and Reporting

Although studies conducted at one location can rarely be used to extrapolate potential impacts or mitigation effectiveness at other locations because of differences in site-specific conditions, it is important that data related to utility-scale wind development be collected in a consistent manner so that the Department is able to make comparisons between sites and consider the cumulative impacts of this type of development. In addition, establishing standard reporting requirements helps ensure that data is provided

to the Department in a timely manner. As such, the Department provides the following data standards and reporting guidelines:

Data Standards

- All datasets should be recorded using a GPS unit with sub-meter accuracy. The data should be presented to the Department for review in the form of a map that depicts the GPS data in GIS format. Hardcopies and electronic files of final datasets should be provided.
- The Department maintains a database of known locations of a number of types of critical wildlife habitat including, but not limited to: deer winter habitat; necessary bear habitat; rare, threatened, and endangered species habitat; Bicknell's thrush habitat; and significant natural communities. The Department may seek to incorporate any new data in its existing database.

Pre-Construction

- Draft reports for all pre-construction surveys need to be provided annually to the Department and within three months of completion of each survey. If requested, the applicant should provide all raw data associated with the surveys to the Department.
- The Department requires a minimum of 30 days to review and provide comment on draft reports.
- Final reports for all preconstruction surveys should be provided within 30 days of receipt of Department comments.

Post-Construction

- Mortality survey reports, including results of scavenging rate control tests and searcher efficiency rate control tests need to be provided semi-annually to the Department, within 30 days of the survey period. All data, results, carcasses and other related information are provided to the Department following each survey period.
- Specific requirements of, and schedule for, any Bicknell's thrush or moose surveys will be established on a project-by-project basis.
- Bear habitat surveys, including mast monitoring data and bear scat/DNA analysis data are provided to the Department annually, by December 31st of survey year.

Section V. Defining a Significant or Undue Adverse Impact

- The Department believes that the impact of utility-scale wind projects on migrating birds and bats could be considered insignificant if bird and bat collision mortality at project sites in Vermont was similar to the national average (2.3 birds/turbine/year and 3.4 bats/turbine/year respectively), and none of the species affected by this source of mortality were considered threatened or endangered by the state or federal government, or species of conservation concern (i.e., rare,

listed as species of conservation concern by the Department or the U.S. Fish and Wildlife Service).

- Utility-scale wind projects that have a fatality rate which exceeds the national average, for birds or bats, may be considered to have an undue adverse impact and require additional monitoring and may require mitigation. Determinations of adverse impact will be made on a site-specific basis, involving comparisons of post-construction mortality survey data to pre-construction acoustical monitoring and radar migration data.
- The direct injury or death of any state or federally listed threatened or endangered species as a result of collision with components of a utility-scale wind project constitutes an undue adverse impact and may require mitigation.
    - In addition, the Department maintains a no net loss policy for Bicknell's thrush habitat given the isolated nature and limited distribution of this critical habitat type. Therefore, if it is determined that Bicknell's Thrush avoid spruce-fir habitat in vicinity of the towers that had been occupied previous to turbine operation, this may constitute an undue adverse impact and require mitigation and/or operational changes.
- Fatalities of bird species whose populations are experiencing significant or long-term decline associated with utility-scale wind projectsmust be carefully considered in the context of cumulative impacts to the species conservation status. Such impacts may be considered significant and therefore constitute an undue adverse impact and require mitigation.
- Beech and other hard mast habitat areas that are used by black bears and are comprised of at least 20 trees are considered significant for the survival and wellbeing of Vermont's bear population. Development that presents direct and indirect impacts to significant black bear habitat, including hard mast habitat areas, wetlands used by bears, and travel corridors used by bears, are considered in light of the Department's *Mitigation Guidelines for Black Bear Habitat in Vermont* and associated past precedent in Act 250 and 248. Any wind energy facility proposed within significant black bear habitat will be reviewed and considered in accordance with these guidelines, precedent and past practice. In general, the Department seeks to avoid impacts to significant black bear habitat to the greatest extent practicable. Projects with unavoidable impacts to significant black bear habitat may require habitat compensation. Habitat compensation typically takes the form of the permanent conservation of similar habitat within the same habitat area or in another habitat area within the same region. Habitat compensation is addressed in the guidelines and is assessed based on habitat compensation ratios.

Section VI. Mitigation Process

The Department expects that during each phase of development of a utility-scale wind project – siting, construction, and operation – applicants will take the necessary steps to ensure: (1) **avoidance** of impacts to necessary wildlife habitat to the maximum extent practicable; (2) **on-site mitigation** of impacts to necessary wildlife habitat that cannot reasonably be avoided; (3) **off-site mitigation** of the functions or values associated with unavoidable impacts to necessary wildlife habitat and when on-site mitigation is not

possible. The following sections: describe Department actions during project development and operation; identify potential impacts to necessary wildlife habitat and migratory birds; and identify habitat specific mitigation actions.

1. ***Pre-Construction Siting and Project Design***

   The Department's process for pre-construction review of utility-scale wind projects relies, in part, on the applicant completing the previously discussed data collection activities, some of which are time-sensitive. As described in these guidelines, it is imperative that the applicant coordinate with the Department early-on to ensure that pre-construction data collection activities will be sufficient to support the Department's evaluation of the proposed project.

   The Department will review all pre-construction survey results and reports in order evaluate the likelihood that the proposed project will result in an undue adverse impact to birds, bats or other wildlife populations and/or their habitat. As a result of this review, the Department may seek revisions to the project, including, but not limited to, reduction in the number of turbines, relocation of turbines, and/or pre-operational agreements outlining conditions for modification of turbine operations (see 3. below).

   In addition, preliminary surveys of migrating birds and bats are needed in order to provide a baseline of population data that will serve as comparison for any post-operation monitoring data. The pre-construction radar and acoustic data will be used, in conjunction with post-operation monitoring data, to determine the level of impact the project presents to migrating birds and bats.

2. ***Construction-Related Impacts***

   Construction activities associated with the development of utility-scale wind projects may adversely affect wildlife through one or more of the following:

   - Habitat reduction, alteration, or fragmentation;
   - Introduction of invasive vegetation;
   - Injury or morality of wildlife; and
   - Interference with behavioral activities, including migratory and reproductive activities.

   In order to avoid or minimize construction-related impacts, the following measures should be employed:

   - Construction activities should be scheduled to avoid important periods of wildlife courtship, breeding, and nesting.
     - Any clearing of montane spruce-fir forest must take place outside the breeding period for Bicknell's thrush.
     - Any construction-related activities within ¼-mile of significant black bear hard mast habitat areas should take place outside the feeding period September 1 – November 21. Any construction-related activities within ¼

mile of significant black bear spring feeding habitat should take place outside the feeding period May 1 – July 15.

- All construction employees should be instructed to avoid harassment and disturbance of wildlife, especially during reproductive seasons. In addition, pets are not permitted on site during construction.
- Noise-reduction devices (e.g., mufflers) should be maintained in good working order on vehicles and construction equipment.
- Habitat restoration activities should be initiated as soon as possible after construction activities are complete.

3. Project Operations

If post-construction monitoring demonstrates that the project is having an undue adverse impact, as defined in Section V above, the Agency will seek mitigation. Appropriate mitigative measures will depend on the type and severity of impacts, the most recent research findings concerning causes of impacts, and practicality. A general discussion of common mitigative measures is provided below; additional measures may be considered depending on future research findings.

- Modified Operations. If post-construction monitoring shows unanticipated turbine impacts which result in bird and/or bat mortality rates that exceed the acceptable thresholds established by the Department, the applicant may need to make changes to its operation. Examples of such changes include: additional monitoring or research to understand the identified impacts and possible mitigation strategies; technological improvements; adjustment of operations during periods of highest risk; suspension of operation during periods of highest risk, provided there is good reason to expect that a non-operating turbine will pose less risk than an operating turbine. For example, if impacts were occurring at night during certain periods of fall migration, the applicant may need to modify operation of the turbine(s) during those high-risk nights.
- Modified Lighting. Studies have shown that lit structures pose a higher risk to birds than unlit structures. In the event that post-construction monitoring demonstrates that the project is having an undue adverse affect, the applicant may be need to evaluate alternative scenarios for aircraft warning lighting, such as reducing the number of turbines with lights, altering the arrangement of lights if not all turbines are lighted, using light emitting diode (LED) or rapid discharge fixtures, or providing baffling around the lights to limit visibility. Any modifications to the lighting strategy employed at the project site would also need to be consistent with the guidelines cited in FAA Advisory Circular 70/7460-1J to the extent those guidelines are required.
- On-Site Habitat Management. The applicant may be asked to consider habitat management measures in the vicinity of the turbines to modify wildlife behavior and reduce the risk of impacts. Such measures would be determined in consultation with the Department in response to specific concerns or impacts that are related to habitat factors. Examples include, but are not limited to, modifying the type or extent of vegetation cover, forest openings, perching and nesting sites, or cover for prey species.

- Habitat Protection. If measures to avoid or minimize impacts are not practicable, compensatory mitigation measures such as protection or enhancement of wildlife habitat may be appropriate. Any such measures would be reviewed and approved by the Department.

Section VII. Revisions to Guidelines

The Department recognizes that science and technology are constantly evolving. Therefore, the Department will revise and adjust this position and procedure as new science and technical information that is pertinent and applicable to the region becomes available. The Department also recognizes that little is known about the impacts of wind energy projects on black bears or montane breeding birds. Although direct impacts to regionally important habitats will be discouraged, the Department welcomes opportunities to cooperate in research that is designed to model indirect impacts to key species and habitats.

The Department wants to encourage a collaborative working relationship with the wind energy industry in order to effectively and efficiently address important issues related to renewable energy development and the conservation of wildlife species breeding in or migrating through Vermont.

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US Fish and Wildlife Service. Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines (May 2003). http://www.fws.gov/habitatconservation/wind.pdf

Old Bird, Inc. – Information and instructions for the development, use and analysis of avian acoustic monitoring units and data. http://oldbird.org/introduction.htm

For additional information please contact the Department at:

(802) 476-0199 in Barre, Vermont for wind energy projects in northern Vermont; or

(802) 885-8832 in Springfield, Vermont for wind energy projects in southern Vermont; and

(802)786-3862 in Rutland, Vermont for wind energy projects relating to impacts on bats.