

Varna Wind, Inc.

# **Natural Heritage Environmental Effects Monitoring Plan (EEMP) for the Bluewater Wind Energy Centre**

**Prepared by:**

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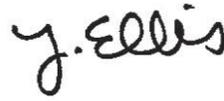
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# 1. Purpose of the Natural Heritage Environmental Effects Monitoring Plan

Varna Wind Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC (NextEra) is proposing to construct a wind energy project in the Municipalities of Bluewater and Huron East in Huron County, Ontario. The project will be referred to as the Bluewater Wind Energy Centre (the “Project”) and will be located on private lands in the vicinity of the shoreline of Lake Huron. AECOM Canada Ltd. (AECOM) was retained by NextEra to prepare an application for the proposed Bluewater Wind Energy Centre (the Project) in accordance with the requirements of the Renewable Energy Approval (REA) process outlined in Ontario Regulation 359/09 (O. Reg. 359/09) under the *Environmental Protection Act* and the Technical Guide to Renewable Energy Approvals (Ontario Ministry of the Environment, 2011).

Under the Renewable Energy Approval (REA) process, an environmental effects monitoring plan (EEMP) must be prepared to address negative environmental effects that may result from engaging in the renewable energy project. The EEMP must set out:

- Performance objectives in respect of the potential negative environmental effects of the project;
- Mitigation measures to assist in achieving the performance objectives;
- A program for monitoring negative environmental effects to ensure that mitigation measures are meeting performance objectives; and,
- A contingency plan to be implemented should monitoring reveal that mitigation measures have failed.

Furthermore, all Class 3 and 4 wind facilities must prepare an EEMP in respect of birds and bats in accordance with the following publications of the Ministry of Natural Resources (MNR):

1. Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, 2011a); and
2. Birds and Bird Habitats: Guidelines for Wind Power Projects (MNR, 2011b).

The post-construction monitoring plan described in this EEMP has been prepared for submission to the Ministry of Natural Resources (MNR) and Ministry of the Environment (MOE) as part of the REA Application for the Project. This document has been prepared in accordance with O. Reg. 359/09, MNR’s *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR’s *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

## 2. Project Overview

A Feed In Tariff (FIT) contract was awarded to Varna Wind Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC (NextEra) by the Ontario Power Authority (OPA) for the construction of the Bluewater Wind Energy Centre. The Project has a nameplate capacity of 60 MW and is categorized as a Class 4 wind project under the REA regulation (O. Reg. 359/09). The project is proposed to be developed on private and public land at the following location(s):

- Upper-tier Municipality: ..... Huron County
- Lower-tier Municipalities: ..... Bluewater and Huron East
- Lot(s) and Concession(s): ..... Numerous (see Figure 1)

The project will consist of the following permanent infrastructure as mapped in Figure 1:

- Up to 40 1.6 MW GE model wind turbine generators and pad mounted step up transformers (a maximum of 37 turbines will ultimately be constructed);
- Approximately 53 km of underground electrical collection lines;
- Approximately 24 km of 115 kV transmission line along Centennial Road and Hensall Road;
- A transformer substation to connect to the Hydro One transmission system;
- Approximately 38 km of turbine access roads; and
- An Operations and Maintenance building.

The project will consist of the following temporary infrastructure as mapped in Figure 1:

- Construction disturbance areas (including temporary staging areas, laydown and storage areas, as well as crane pads and turnaround areas surrounding each wind turbine).

### 3. Post-Construction Monitoring for Significant Natural Features

As indicated in the Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report (AECOM, 2012a), the Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report Amendment (AECOM, 2013a), the Bluewater Pre-construction Assessment and Determination of Significance Report (AECOM, 2013b), and the Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report Second Amendment (AECOM, 2013c) prepared in accordance with Section 38(2) of the REA Regulation (O. Reg. 359/09), the following confirmed significant and provincially significant natural features will receive post-construction monitoring:

- Bat Maternity Colony features BMC-01, BMC-07, BMC-08, BMC-13;
- Red-headed Woodpecker Habitat feature SCB-02;
- Amphibian Woodland Breeding Habitat feature AWO-11; and
- Amphibian Wetland Breeding Habitat feature AWE-01.

The following natural features were treated as significant and will receive post-construction monitoring if confirmed to be significant based on the outcome of pre-construction evaluation surveys:

- Amphibian Woodland Breeding Habitat feature AWO-13.

The location of each significant or provincially significant natural feature, including features treated as significant as described above, which require post-construction monitoring is shown in Figure 1. The potential negative environmental effects, performance objectives, mitigation strategy, environmental effects monitoring plan and contingency measures are described in Table 1 (originally described in AECOM, 2012a; AECOM, 2012b; and AECOM, 2013c). The environmental effects monitoring plan for each feature includes the post-construction survey methods, monitoring locations, frequency and duration of sample collection, technical and statistical value of the data, and reporting requirements.

#### 3.1 Contingency Measures

Where mitigation measures are found to not be effective, the contingency measure identified in Table 1 will be implemented immediately. If contingency measures need to be implemented, MNR will be notified immediately, and if required, MNR will be consulted to determine appropriate contingency measures.



**Table 1. Summary of the Environmental Effects Monitoring Plan for Significant/Provincially Significant Natural Features In or Within 120 m of the Bluewater Wind Energy Centre where an Operational Impact Has the Potential to Occur**

Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	Contingency Measure
<b>Bat Maternity Colonies BMC-01, BMC-07, BMC-08, BMC-13</b>	<ul style="list-style-type: none"> <li>Bats may be disturbed or may avoid habitat due to turbine operation.</li> </ul>	<ul style="list-style-type: none"> <li>No displacement of bats from habitat</li> </ul>	<ul style="list-style-type: none"> <li>Implement mitigation when disturbance/avoidance effects are detected through post-construction monitoring.</li> <li>If significant declines or disappearance of species is detected, determine whether likely to have been caused by the Project. If so, corrective measures will be taken and will be determined through consultation with MNR.</li> <li>Additional monitoring will be conducted to determine effectiveness of the mitigation.</li> <li>Mitigation will be based on best available information and science. Emerging technology will be explored.</li> <li>Where bat mortality at a single turbine within 120 m of a significant bat maternity colony exceeds 10 bats/turbine, MNR will be consulted and appropriate mitigation will be implemented, which may include periodic shutdown or blade feathering during high mortality periods (e.g. migration).</li> </ul>	<ul style="list-style-type: none"> <li>Conduct 3 years of post-construction acoustic monitoring for Features BMC-01, BMC-07, BMC-08 and BMC-13 where located within 30 m of construction activities according to protocol described for pre-construction surveys, as described in March 2010 version of Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, 2010).</li> <li>See Appendix A for detailed survey methods.</li> </ul>	<ul style="list-style-type: none"> <li>Within features at snag/tree cavities monitored during pre-construction surveys. If this is not possible (e.g. due to change in permission to enter private property), MNR will be consulted.</li> <li>Co-ordinates (UTMs) of monitoring locations are provided in Appendix A. See Appendix B (Figure 3) for map of monitoring locations.</li> </ul>	<ul style="list-style-type: none"> <li>Post-construction monitoring will be conducted in:                             <ul style="list-style-type: none"> <li>June 2014</li> <li>June 2015</li> <li>June 2016</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Determine if there is a displacement or avoidance effect caused by turbines located in proximity to bat maternity colonies.</li> </ul>	<ul style="list-style-type: none"> <li>Annual Reports submitted to MNR, Estimated Report Submission Dates:                             <ul style="list-style-type: none"> <li>February 2015 (yr 1 post-construction)</li> <li>February 2016 (yr 2 post-construction)</li> <li>February 2017 (yr 3 post-construction)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>If mitigation measures are found to be ineffective, contingency measures will be determined in consultation with MNR and implemented. Additional monitoring will be conducted to determine effectiveness of the contingency measures.</li> </ul>
<b>Red-headed Woodpecker Habitat SCB-02</b>	<ul style="list-style-type: none"> <li>Red-headed Woodpecker Breeding Habitat may be disturbed by routine maintenance of the transmission line corridor and/or vegetation removed during construction of the transmission line.</li> </ul>	<ul style="list-style-type: none"> <li>No displacement of breeding Red-headed Woodpeckers from habitat</li> <li>No destruction of nesting habitat.</li> </ul>	<ul style="list-style-type: none"> <li>Schedule maintenance operations such as vegetation clearing to occur outside the breeding season of May 1 to July 31.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct 3 years of post-construction monitoring for Feature SCB-02, according to protocol described for pre-construction surveys.</li> <li>See Appendix A for detailed survey methods.</li> </ul>	<ul style="list-style-type: none"> <li>Point count station established within feature SCB-02 during pre-construction surveys will be monitored during post-construction surveys.</li> <li>Utility poles will be examined for signs of nesting Red-headed Woodpecker.</li> <li>Co-ordinates (UTMs) of monitoring locations are provided in Appendix A. See Appendix B (Figure 4) for map of monitoring locations.</li> </ul>	<ul style="list-style-type: none"> <li>Post-construction surveys between May 15 – July 10 in:                             <ul style="list-style-type: none"> <li>2014</li> <li>2015</li> <li>2016</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Determine if there is displacement of Red-headed Woodpeckers from the habitat as a result of construction and routine maintenance of the transmission line.</li> </ul>	<ul style="list-style-type: none"> <li>Annual Reports submitted to MNR, Estimated Report Submission Dates:                             <ul style="list-style-type: none"> <li>February 2015 (yr 1 post-construction)</li> <li>February 2016 (yr 2 post-construction)</li> <li>February 2017 (yr 3 post-construction)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>If significant declines or disappearance of species is detected, determine whether likely to have been caused by the Project. If so, corrective measures will be taken, to be determined through consultation with MNR</li> </ul>
<b>Amphibian Woodland Breeding Habitat AWO-11, AWO-13* (pre-construction survey required to verify significance of this feature. If not significant, the mitigation measures, monitoring plan and contingency measures will not be implemented)</b>	<ul style="list-style-type: none"> <li>Risk of mortality to amphibians moving between breeding pools and home range.</li> </ul>	<ul style="list-style-type: none"> <li>No amphibian mortality along access roads near significant features.</li> </ul>	<ul style="list-style-type: none"> <li>Advise operations staff to avoid driving roads in proximity to these features at night between April 1 and June 30 for significant frog breeding habitats) or between March 15 and April 30 for significant salamander breeding habitat), and any rainy nights from spring to early autumn, where possible.</li> <li>Maintain wildlife crossing signs and limit speed of vehicles near crossings.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct 3 years post-construction amphibian call surveys (frogs and toads) and egg mass or adult surveys (salamanders) according to protocol described for pre-construction surveys to assess any potential changes in amphibian breeding populations or species distribution.</li> <li>See Appendix A for detailed survey methods.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring stations established during pre-construction surveys (typically within features located at the edge of vernal pools or ponds) will be monitored during post-construction surveys. If this is not possible (e.g. due to change in permission to enter private property), MNR will be consulted.</li> <li>Co-ordinates (UTMs) of monitoring locations are provided in Appendix A. See Appendix B (Figures 1 and 2) for maps of monitoring locations.</li> </ul>	<ul style="list-style-type: none"> <li>Pre-construction survey for AWO-13:                             <ul style="list-style-type: none"> <li>Spring 2013</li> </ul> </li> <li>Post-construction surveys:                             <ul style="list-style-type: none"> <li>Spring 2014</li> <li>Spring 2015</li> <li>Spring 2016</li> </ul> </li> <li>Note: If AWO-13 is determined to be not significant during pre-construction surveys, then feature AWO-13 will not require post-construction surveys.</li> </ul>	<ul style="list-style-type: none"> <li>Determine if there are any changes in amphibian breeding populations as a result of access roads near significant features.</li> </ul>	<ul style="list-style-type: none"> <li>Annual Reports submitted to MNR, Estimated Report Submission Dates:                             <ul style="list-style-type: none"> <li>Summer 2013 (pre-construction data)</li> <li>February 2015 (yr 1 post-construction)</li> <li>February 2016 (yr 2 post-construction)</li> <li>February 2017 (yr 3 post-construction)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>If significant declines or disappearance of species is detected, determine whether likely to have been caused by the Project. If so, corrective measures will be taken, to be determined through consultation with MNR.</li> </ul>

**Table 1. Summary of the Environmental Effects Monitoring Plan for Significant/Provincially Significant Natural Features In or Within 120 m of the Bluewater Wind Energy Centre where an Operational Impact Has the Potential to Occur**

Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	Contingency Measure
<b>Amphibian Wetland Breeding Habitat AWE-01</b>	<ul style="list-style-type: none"> <li>• Risk of mortality to amphibians moving between breeding pools and home range.</li> </ul>	<ul style="list-style-type: none"> <li>• No amphibian mortality along access roads near significant features.</li> </ul>	<ul style="list-style-type: none"> <li>• Advise operations staff to avoid driving roads in proximity to these features at night between April 1 and June 30, and any rainy nights from spring to early autumn, where possible.</li> <li>• Maintain wildlife crossing signs and limit speed of vehicles near crossings.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct 3 years post-construction amphibian call surveys (frogs and toads) and egg mass or adult surveys (salamanders) according to protocol described for pre-construction surveys to assess any potential changes in amphibian breeding populations or species distribution.</li> <li>• See Appendix A for detailed survey methods.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring stations established during pre-construction surveys (typically within features located at the edge of vernal pools or ponds) will be monitored during post-construction surveys. If this is not possible (e.g. due to change in permission to enter private property), MNR will be consulted.</li> <li>• Co-ordinates (UTMs) of monitoring locations are provided in Appendix A. See Appendix B (Figure 5) for map of monitoring location.</li> </ul>	<ul style="list-style-type: none"> <li>• Post-construction surveys:                             <ul style="list-style-type: none"> <li>▪ Spring 2014</li> <li>▪ Spring 2015</li> <li>▪ Spring 2016</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Determine if there are any changes in amphibian breeding populations as a result of access roads near significant features.</li> </ul>	<ul style="list-style-type: none"> <li>• Annual Reports submitted to MNR. Estimated Report Submission Dates:                             <ul style="list-style-type: none"> <li>▪ February 2015 (yr 1 post-construction)</li> <li>▪ February 2016 (yr 2 post-construction)</li> <li>▪ February 2017 (yr 3 post-construction)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• If significant declines or disappearance of species is detected, determine whether likely to have been caused by the Project. If so, corrective measures will be taken, to be determined through consultation with MNR.</li> </ul>

## 4. Post-Construction Monitoring for Bat and Bird Mortality

Post-construction mortality surveys are required for all Class 3 and 4 wind power projects. This Post-Construction Monitoring Plan is one component of the EEMP of the REA Application for the Project, and has been prepared in accordance with MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

### 4.1 Mortality Thresholds

As required by MNR (MNR, 2011a and MNR, 2011b), a threshold approach will be used to identify and mitigate significant bat and/or bird mortality resulting from the operation of wind turbines.

#### 4.1.1 Bats

Bat mortality is considered to be significant when a threshold of annual bat mortality (averaged across the Project) exceeds:

- 10 bats / turbine / year

This threshold has been determined by MNR based on bat mortality reported at wind power projects in Ontario and comparison with jurisdictions across North America (MNR, 2011a).

#### 4.1.2 Birds

Bird mortality is considered to be significant when a threshold of annual bird mortality exceeds:

- 14 birds / year at individual turbines or turbine groups;
- 0.2 raptors / turbine / year (all raptors) across a wind power project; or
- 0.1 raptors / turbine / year (provincially tracked raptors) across a wind power project.

Provincially tracked raptors are defined as raptors of provincial conservation concern by MNR's Natural Heritage Information Centre (NHIC) (MNR, 2011b).

These thresholds have been determined by MNR based on the range of bird mortality reported at wind power projects in Ontario and comparison with jurisdictions across North America (MNR, 2011b).

### 4.2 Post-Construction Monitoring Methods

Post construction bat and bird mortality surveys estimate bird and bat mortality from wind turbines and may identify species and specific periods of high mortality. This information can be used to evaluate the success of mitigation measures, establish protocols for operational mitigation, and inform adaptive management.

Bat and bird mortality surveys identify the number of bats or birds killed per turbine over a known period of time (expressed as bats / turbine / year or birds / turbine / year). This value represents an estimate of bat and bird mortality adjusted for carcass removal rates, searcher efficiency, and percent area searched. Standard methodologies for mortality surveys are identified below.

For bats and birds, a monitoring year is considered to be from May 1 – October 31, and continues until November 30 specifically for raptor monitoring. Should additional bat mortality be found based on supplemental monitoring (e.g., associated with significant wildlife habitat) and using the same standard protocols, this mortality will be included in the calculation of mortality rates. In this case, the year is all reporting periods in one calendar year (i.e., from January 1 – December 31).

Post-construction monitoring is required for 3 years at all Class 3 and 4 wind power projects. Post-construction monitoring will consist of:

- Regular bat/bird mortality surveys around specific wind turbines;
- Monitoring of bat/bird carcass removal rate by scavengers (or other means);
- Monitoring of bird/bat searcher efficiency (i.e., number of bat/bird fatalities present that are actually detected by surveyors);
- Avoidance-disturbance effects monitoring (where a project is located within 120 m of bat Significant Wildlife Habitat);
- For birds, subsequent 2 years of scoped mortality and cause and effects monitoring at individual turbines (and unmonitored turbines in near proximity), following any given year where an annual post-construction mortality report identifies significant bird or raptor mortality; and
- For bird and/or bats, should significant mortality be observed and operational mitigation implemented, post-construction monitoring will be conducted for an additional 3 years from the implementation of operational mitigation to evaluate the effectiveness of the mitigation.

All searchers will have updated rabies pre-exposure vaccinations.

#### 4.2.1 Effort and Timing for Bird and Bat Mortality Monitoring

Minimum requirements for post-construction monitoring of bats and birds include:

- Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) will be conducted during the core season when bats are active and in co-ordination with bird mortality monitoring (May 1 to October 31) for the first 3 years of wind turbine operation.
- A sub-sample of at least 30% of turbines will be selected to cover representative areas throughout the Project location.
- Bat and bird mortality surveys will be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1 to October 31; surveys for raptor mortality will be continued once per week from November 1 to November 30.
- For birds, all turbines within the project location will be monitored once a month during the May 1 to November 30 survey period for evidence of raptor mortalities.
- Where significant annual bird mortality is identified, subsequent scoped mortality and cause effects monitoring will be conducted for 2 years at individual turbines (and unmonitored turbines in near proximity).

A minimum of 11 turbines (30% of 37 turbines) will be selected in consultation with MNR to cover representative areas throughout the Project location following completion of pre-construction Evaluation of Significance surveys and determination of which turbines (37 of 40) will ultimately be constructed. Post-construction monitoring will begin May 1<sup>st</sup> of the year that the Project is fully operational. The commercial operation date of the Bluewater Wind Energy Centre is November 1, 2013; therefore, it is anticipated that post-construction monitoring will begin May 1, 2014.

If full Project commissioning is delayed, post-construction monitoring of a partially completed project will not be delayed for longer than 1 year. If the Project is constructed in phases, monitoring for each phase will coincide with the commencement of operation of that phase. When available, post-construction monitoring data may be useful in considering potential effects on bats and bat habitat in adjacent phases.

The above monitoring methods may be modified in consultation with MNR.

#### 4.2.2 Carcass Searches

Carcass removal by scavengers is highly variable among sites (varying by vegetation cover, terrain and season) and must be considered when estimating total bat and bird mortality. Carcass searches will consider the following:

- The sub-sample of wind turbines that are monitored will include all habitat types and any significant wildlife habitat present at the site, and will cover the spatial distribution of the wind turbines. Wind turbines will be selected through a scientifically defensible system (e.g., stratification).
- The time required to search each turbine will vary depending on the surrounding habitat (e.g., open field vs. forest, etc.) and individual searchers, but searchers will aim for a consistent search time for all surveyed turbines (e.g., 20 minutes per turbine).
- Each surveyed turbine will have a search area that has a 50 m radius.
- Within this 50 m radius, the search area will be examined using transects 5.0 to 6.0 m apart allowing for a visual search of 2.5 to 3.0 m on each side. The search area may be rectangular, square or circular depending on turbine locations and arrangements and surrounding terrain.
- The search area of each turbine will be mapped into visibility classes according to the following table. Where the majority of the search area would not be searchable due to vegetation cover or other impediments (e.g., Visibility Class 4) these turbines will not be included in the sub-sample of monitored turbines.

<b>%Vegetation Cover</b>	<b>Vegetation Height</b>	<b>Visibility Class</b>
<b>≥90% Bare Ground</b>	≤15 cm tall	Class 1 (Easy)
<b>≥25% Bare Ground</b>	≤15 cm tall	Class 2 (Moderate)
<b>≤25% Bare Ground</b>	≤25% > 30 cm tall	Class 3 (Difficult)
<b>Little or No Bare Ground</b>	≥25% > 30 cm tall	Class 4 (Very Difficult)

- Where possible, ground cover around turbines will be maintained at a low level in order to facilitate more accurate bat and bird mortality surveys.
- Mortality surveys that incorporate the use of trained dogs (i.e., dog handler teams to locate mortalities) to improve searcher efficiency will be considered, particularly in difficult terrain.
- All carcasses found will be photographed and recorded/labelled with species, sex, date, time, location (UTM co-ordinate), carcass condition, searcher, injuries, ground cover, and distance and direction to nearest turbine.
- Weather conditions including wind speed and precipitation will be included as part of the data collection.

- The estimated number of days since death, and condition of each carcass collected will be recorded in one of the following categories:
  - Fresh;
  - Early decomposition;
  - Moderate decomposition;
  - Advanced decomposition;
  - Complete decomposition; or
  - Scavenged.
- Bird carcasses found during mortality monitoring will be collected and stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition.
- Carcasses of the following species found during bat mortality searches will be stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition:
  - *Lasionycteris noctivagans* (Silver-haired Bat);
  - *Lasiurus cinereus* (Hoary Bat); and
  - *Lasiurus borealis* (Eastern Red Bat).
- Because of white-nose syndrome contamination risks, the following species will not be used in carcass removal or searcher efficiency trials (carcasses of these species may be sent to the Canadian Co-operative Wildlife Health Centre for analysis of white-nose syndrome):
  - *Myotis septentrionalis* (Northern Long-eared Bat);
  - *Myotis lucifugus* (Little Brown Bat);
  - *Myotis leibii* (Eastern Small-footed Bat);
  - *Perimyotis subflavus* (Tricolored Bat); and
  - *Eptesicus fuscus* (Big Brown Bat).

The above carcass search methods may be modified in consultation with MNR.

#### 4.2.3 Carcass Removal Trials

The level of carcass scavenging must be determined through carcass removal trials. In these trials carcasses are placed around the wind turbines and monitored until they disappear. The average carcass removal time is a factor in determining the estimated bat or bird mortality. As carcass removal rates vary considerably from one site to another and seasonally, removal trials must be conducted at every wind power project for every year of monitoring.

Below are some important considerations for conducting carcass removal rate trials:

- Carcass removal trials will be conducted at least once a season (Spring: May/June; Summer: July/August; and Fall: September/October) during the same period as the mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g., crops grow, harvest, etc.).
- A minimum of 10 carcasses will be used for each trial, with **no more than 5 trial carcasses placed at any one time**.
- Placed carcasses will be monitored every 3-4 days in conjunction with carcass searches.
- Carcass removal trials will be conducted in a variety of weather conditions. Weather conditions will be recorded.

- Carcasses will be distributed across the range of different substrates/habitats and visibility classes of turbines being searched.
- To the extent possible, carcass removal trials will be conducted at turbines that are not part of the carcass search sub-sample.
- Carcasses will be placed before dusk using gloves and boots to avoid imparting human smell that might bias trial results (e.g., attract scavengers, etc.).
- Trials will continue until all carcasses are removed or have completely decomposed (generally 2 weeks).
- To avoid confusion with turbine related fatalities, trial carcasses will be discretely marked (e.g., clipping of ear, wing, fur; hole punching ear, etc.) with a unique identification so they can be identified as trial carcasses.
- Carcasses used will be as fresh as possible since frozen or decomposed carcasses are less attractive to scavengers. If frozen carcasses are used, they will be thawed prior to beginning carcass removal trials.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g., mice, brown chicks) may also be used when bird and bat carcasses are not available.
- Scavenging rates may change over time as scavengers become aware of and develop search images for new sources of food beneath turbines.
- Scavenging will be determined on a site-specific basis and rates will not be assumed to be similar between sites or used in calculations for other projects.

The above carcass removal trial methods may be modified in consultation with MNR.

#### 4.2.4 Searcher Efficiency Trials

Searcher efficiency is another important factor in creating an estimate of total bat and bird mortality. Searcher efficiency trials require a known number of discretely marked carcasses to be placed around a wind turbine. Searchers examine the wind turbine area, and the number of carcasses that they find is compared to the number of carcasses placed. Searcher efficiency will vary considerably for each searcher and from one site to another (varying by vegetation cover, terrain and season), and will be conducted as part of post-construction monitoring at every wind power project for every year of monitoring.

Below are some important considerations for conducting searcher efficiency trials:

- Searcher efficiency trials will be conducted at least once a season (Spring: May/June; Summer: July/August; and Fall: September/October) during the same period as the bat and bird mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g., crops grow, harvest, etc.).
- A 'tester' will control the trials and return to collect marked trial carcasses at the completion of the trials to determine the number of carcasses remaining and if any carcasses were scavenged or removed during the trial.
- Searcher efficiency trials are to be conducted for each individual searcher or team involved in searching for carcasses (including teams using dogs). The searcher will not be notified when they are participating in an efficiency trial to avoid potential search biases.

- A minimum of 10 carcasses per searcher per season in all applicable visibility classes (see table above) are to be used. The average per searcher across all visibility classes will be used for calculations; this average may be weighted by the relative proportion of turbines in each visibility class.
- Trial carcasses will be spread out over the trial period (month or season) and conducted with the mortality surveys. **A maximum of 3 trial carcasses will be placed at any one time to avoid bias and flooding the area with carcasses.**
- Trial carcasses are placed for one search period only and then removed and recorded by the ‘tester’.
- Trial carcasses will be randomly placed within the search area and location recorded so that they can be retrieved if they are not found during the trial.
- Trial carcasses will be discreetly marked (e.g., clipping of ear, wing, leg, fur; hole-punching ear, etc.) with a unique identification so that they can be identified as a trial carcass by the tester.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g., mice, brown chicks or chickens) may also be used when bird and bat carcasses are not available.
- If frozen carcasses are used, they will be thawed prior to beginning searcher efficiency trials.

The above searcher efficiency trial methods may be modified in consultation with MNR.

#### 4.2.5 Proportion Area Searched

Based on current Ontario post-construction data, most bats and birds appear to fall within 50 m of a wind turbine base. This area therefore represents the maximum recommended search area. Since it may not always be possible to search the entire 50 m radius because of the presence of thick or tall vegetation, steep slopes, active cultivation, etc. the actual area searched during the mortality surveys will be calculated at each turbine, using a GPS or comparable device/methods. A map of the actual search area for each turbine searched, and a description of areas deemed to be unsearchable (e.g., vegetation height, type, slope, etc.), will be provided in the mortality report.

#### 4.2.6 Calculations

### Scavenger Correction Factor

The following formula will be used to calculate the overall scavenger correction ( $S_c$ ) factors based on the proportion of carcasses remaining after each search interval are pooled:

$$S_c = \frac{n_{visit1} + n_{visit2} + n_{visit3}}{n_{visit0} + n_{visit1} + n_{visit2}}$$

Where,  $S_c$  .....is the proportion of carcasses not removed by scavengers over the search period;  
 $n_{visit0}$  .....is the total number of carcasses placed; and  
 $n_{visit1} - n_{visit3}$  .....are the numbers of carcasses on visits 1 through 3.

**Searcher Efficiency**

Searcher efficiency (S<sub>e</sub>) will be calculated for each searcher as follows:

$$S_e = \frac{\text{number of test carcasses found}}{\text{number of test carcasses placed} - \text{number of carcasses scavenged}}$$

The number of turbines that each individual searches will vary therefore it will be necessary to calculate a weighted average that reflects the proportion of turbines searched by each searcher. The weighted average or overall searcher efficiency will be calculated as follows:

$$S_{e0} = S_{e1}(n_1/T) + S_{e2}(n_2/T) + S_{e3}(n_3/T)...$$

Where, S<sub>e0</sub>.....is the overall searcher efficiency;  
 S<sub>e1</sub> and <sub>2</sub> and <sub>3</sub>.....are individual searcher efficiency ratings;  
 N<sub>1</sub> and <sub>2</sub> and <sub>3</sub>.....are number of turbines searched by each searcher; and  
 T.....is the total number of turbines searched by all searchers.

**Proportion Area Searched**

Proportion area searched (P<sub>s</sub>) is calculated as follows:

$$P_s = \frac{\text{actual area searched}}{\pi r^2}$$

Where r = 50 m.

**Corrected Mortality Estimates**

The minimum estimated bat mortality (C) is calculated as follows:

$$C = c / (S_{e0} \times S_c \times P_s)$$

Where, C .....is the corrected number of bat fatalities;  
 c.....is the number of carcasses found;  
 S<sub>e0</sub>..... is the weighted proportion of carcasses expected to be found by searchers (overall searcher efficiency);  
 S<sub>c</sub> ..... is the proportion of carcasses not removed by scavengers over the search period; and  
 P<sub>s</sub>..... is the proportion of the area searched.

**4.2.7 Other Considerations**

- The above calculations will be presented in corrected numbers of bats/turbine per year and birds/turbine /year. In this context, the year is from May 1 to October 31 for all bats and birds and continues until November 30 specifically for raptor monitoring.
- A separate calculation for raptor mortality will use the searcher efficiency and carcass removal results relevant to raptors.

- Carcasses may be discovered incidental to formal searches. These carcasses will be processed (i.e., collected and recorded, etc.) and fatality data will be included with the calculation of fatality rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be reported separately.
- Should additional bat mortality be found based on supplemental monitoring (e.g., associated with Significant Wildlife Habitat) and using the same standard protocols, this mortality will be included in the calculation or mortality rates. In this case, the year is all reporting periods in one calendar year (i.e., from January 1 to December 31).
- Tissue samples from bat and bird carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin of migrants. The local MNR office may be contacted prior to disposing bat and bird carcasses, to determine if this type of research is occurring in the area.

## 4.3 Post-Construction Mitigation

### 4.3.1 Bats

Post-construction mitigation will be required where post-construction monitoring identifies disturbance effects associated with bat Significant Wildlife Habitat. Operational mitigation is required if post-construction monitoring shows that a wind power project is causing significant bat mortality. Bat mortality is considered significant when mortality levels at a Project location exceed 10 bats / turbine / year.

Operational mitigation refers to adjustments made to the operation of wind turbines to help mitigate potential negative environmental effects on bats (i.e., significant bat mortality). Operational mitigation for bat mortality includes changing the wind turbine cut-in speed to 5.5 m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5 m/s.

The majority of bat mortalities from wind turbine operations occur during fall migration. Across North America, it is estimated that 90% of bat fatalities occur from mid-July through September. Where a post-construction monitoring annual report indicates that the annual bat mortality threshold of 10 bats / turbine / year has been exceeded, operational mitigation will be implemented across the wind power project (i.e., at all turbines) from sunset to sunrise, from July 15 to September 30. This mitigation will continue for the duration of the Project. Should site-specific monitoring indicate a shifted peak mortality period, operational mitigation may be shifted to match the peak mortality, with mitigation maintained for a minimum duration of 10 weeks. Any shift in the operational mitigation period to match peak mortality should be determined in co-ordination with and confirmed by MNR.

Where post-construction mitigation is applied, an additional 3 years of effectiveness monitoring is required. Monitoring the effectiveness of any post-construction mitigation techniques will help to evaluate the success of this mitigation.

### 4.3.2 Birds

Post-construction mitigation or additional scoped monitoring will be required at individual turbines or groups of turbines where post-construction monitoring identifies significant annual bird mortality, disturbance effects associated with bird Significant Wildlife Habitat, or significant bird mortality events.

For turbines located outside 120 m of bird Significant Wildlife Habitat, 2 years of subsequent scoped mortality and cause and effects monitoring are required where a significant annual mortality threshold has been exceeded. Following scoped monitoring, post-construction mitigation (e.g., operational mitigation) and effectiveness monitoring may be required at individual turbines or turbine groups where a mortality effect has been identified or significant annual mortality persists.

For turbines located within 120 m of bird Significant Wildlife Habitat, immediate post-construction mitigation (including operational mitigation), as identified in the Environmental Impact Study, and 3 years of effectiveness monitoring will be required where monitoring identifies significant annual bird mortality or disturbance effects associated with bird Significant Wildlife Habitat.

Operational mitigation techniques may include periodic shut-down of select turbines and/or blade feathering at specific times of the year when mortality risks to the affected bird species is particularly high (e.g., migration).

Emerging and new technologies may be considered to reduce bird and/or bat fatalities.

#### **4.4 Contingency Plans**

A contingency plan addresses immediate actions necessary in case of a significant bat or bird mortality event, or if mitigation actions fail. A contingency plan allows additional mitigation measures to be implemented in the event that unanticipated negative environmental effects are observed during a single mortality monitoring survey.

##### **4.4.1 Bats**

Should cut-in speed mitigation be implemented and the bat mortality threshold continue to be exceeded, additional mitigation and scoped monitoring requirements will be determined in consultation with MNR.

##### **4.4.2 Birds**

Should mitigation be implemented and the bird mortality threshold continue to be exceeded, additional mitigation and scoped monitoring requirements will be determined in consultation with MNR.

A contingency plan is required when a significant bird mortality event occurs. A significant bird mortality event is defined to have occurred when bird mortality during a single mortality monitoring survey (as observed in the field on a single day) exceeds:

- 10 or more birds at any one turbine; or
- 33 or more birds (including raptors) at multiple turbines.

*NOTE: These numbers are actual carcasses found (not corrected numbers)*

MNR will be notified within 48 hours if one of the thresholds above is exceeded during a single mortality monitoring survey. MNR will be consulted to determine appropriate contingency plans should a significant bird mortality event occur or if mitigation actions fail.

## **5. Additional Post-construction Commitments**

The following significant woodland features will be impacted through vegetation clearing during the construction of the transmission line for the Bluewater project:

- AJ
- AP
- AO

Up to 0.5 ha of forest cover will be removed. To compensate for the loss of woodlands, a new area of forest will be established that is equal to the area to be cleared (total area to be determined through a post-construction site inspection). Tree planting and management may be conducted in partnership with a local organization (e.g. in partnership with a local Conservation Authority). Details of the afforestation plan will be prepared in consultation with MNR. A copy of the Compensation Plan will be provided to MNR.

This plan must be prepared and provided to MNR within the first year of operation of the project.

## 6. Species at Risk

The Species at Risk in Ontario List (O.Reg 230/08) will be consulted to determine species listed as Endangered or Threatened in Ontario. Mortality or injury of an Endangered or Threatened species will be reported to Ministry of Natural Resources within 48 hours of detection.

## 7. Reporting Requirements

### 7.1 Timing of Report Submissions

The Ministry of Environment (MOE) will be provided with a report that summarizes the results of the EEMP for all aspects of the project. The Ministry of Natural Resources (MNR) will be provided with an annual report that summarizes the results of the post-construction monitoring plan described in this report. Ministry of Natural Resources will also be provided with results of any outstanding pre-construction surveys and all post-construction surveys. Below is a summary of the anticipated report submission dates and the contents of each report:

#### 7.1.1 Pre-construction Survey Reports

- **July 2013** for the following feature:
  - AWO-13

#### 7.1.2 Post-construction Monitoring Reports for Significant Natural Features

- **February 2015** – 1<sup>st</sup> year post construction monitoring results for the following features:
  - Bat Maternity Colonies (BMC-01, BMC-07, BMC-08, BMC-13)
  - Red-headed Woodpecker Habitat (SCB-02)
  - Amphibian Woodland Breeding Habitat (AWO-11 and AWO-13 if AWO-13 is deemed significant upon completion of pre-construction surveys)
  - Amphibian Wetland Breeding Habitat (AWE-01)
- **February 2016** – 2<sup>nd</sup> year post-construction monitoring results for the following features:
  - Bat Maternity Colonies (BMC-01, BMC-07, BMC-08, BMC-13)
  - Red-headed Woodpecker Habitat (SCB-02)
  - Amphibian Woodland Breeding Habitat (AWO-11 and AWO-13 if AWO-13 is deemed significant upon completion of pre-construction surveys)
  - Amphibian Wetland Breeding Habitat (AWE-01)

- **February 2017** – 3<sup>rd</sup> year post-construction monitoring results for the following features:
  - Bat Maternity Colonies (BMC-01, BMC-07, BMC-08, BMC-13)
  - Red-headed Woodpecker Habitat (SCB-02)
  - Amphibian Woodland Breeding Habitat (AWO-11 and AWO-13 if AWO-13 is deemed significant upon completion of pre-construction surveys)
  - Amphibian Wetland Breeding Habitat (AWE-01)

### 7.1.3 Post-construction Monitoring for Bat and Bird Mortality

- **February 2015** – 1<sup>st</sup> year (May 1-Nov 30, 2014) post-construction bird and bat mortality monitoring results
- **February 2016** – 2<sup>nd</sup> year (May1-Nov 30, 2015) post-construction bird and bat mortality monitoring results
- **February 2017** – 3<sup>rd</sup> year (May1-Nov 30, 2016) post-construction bird and bat mortality monitoring results

*Note: Where a single mortality event of 10 birds/turbine or 33 birds (including raptors) at multiple turbines is observed, the event will be documented and reported to MNR within 48 hours of detection.*

### 7.1.4 Other Reporting Requirements

- **On or before December 2014** – Tree Compensation Plan for Removal of Significant Woodlands

Additional monitoring and reports may be required if:

- a) mortality thresholds are exceeded and mitigation/contingency measures are implemented, or
- b) Negative effects to significant natural features are observed and mitigation/contingency measures are implemented.

In both cases, reports that detail effectiveness monitoring results will be required. The timing and frequency of these reports will be determined in consultation with MNR.

## 7.2 Data Standards for Annual Mortality Monitoring Reports

All bat and bird mortality monitoring data and associated reports will be submitted to the Ministry of the Environment and MNR, consistent with MNR's procedures and protocols, and satisfy the data standards and requirements of the Wind Energy Bird and Bat Monitoring Database. Submitted bird and bat survey data will be entered into the database, analyzed, reported and used to address knowledge gaps and create public data summaries. Standardized templates available online through the Wind Energy Bird and Bat Monitoring Database (refer to Appendix C and Bird Studies Canada website) will be used to record and report all field data.

Reports will also include maps of areas searched for each surveyed turbine, and raw data for all carcass searches, searcher efficiency trials and carcass removal trials will be required as part of the annual report. A data sheet sample will also be provided with the mortality report.

## 8. References

- AECOM, 2013a:  
Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report Amendment. Prepared for NextEra Energy Canada, ULC. January 2013.
- AECOM, 2013b:  
Bluewater Pre-construction Assessment and Determination of Significance Report. Prepared for NextEra Energy Canada, ULC. February 2013.
- AECOM, 2013c:  
Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report Second Amendment. Prepared for NextEra Energy Canada, ULC. August 2013.
- AECOM, 2012a:  
Bluewater Wind Energy Centre Natural Heritage Assessment and Environmental Impact Study Report. Prepared for NextEra Energy Canada, ULC. March 2012.
- AECOM, 2012b:  
Bluewater Wind Energy Centre Design and Operations Report. Prepared for NextEra Energy Canada, ULC. June 2012.
- OMNR, 2011a:  
Bats and Bat Habitats: Guidelines for Wind Power Projects. First Edition. Queen's Printer for Ontario, Canada.
- OMNR, 2011b:  
Birds and Bird Habitats: Guidelines for Wind Power Projects. First Edition. Queen's Printer for Ontario, Canada.
- OMNR, 2010:  
Bats and Bat Habitats: Guidelines for Wind Power Projects. Draft. Queen's Printer for Ontario, Canada.
- OMOE, 2011:  
Technical Guide to Renewable Energy Approvals. Queen's Printer for Ontario, Canada.

# Appendix A

## Detailed Survey Methods

## Appendix A Detailed Survey Methods

The following methods were used to conduct pre-construction evaluation of significance surveys for candidate significant wildlife habitats located in or within 120 m of the Project. These methods will be used to conduct post-construction surveys according to the monitoring plan described in this report. If these protocols cannot be followed (e.g., because access to properties is not granted), MNR will be consulted.

### Bat Maternity Colonies

Candidate significant bat maternity colonies were evaluated by Natural Resources Solutions Inc. (NRSI). NRSI biologists conducted through-the-night acoustic bat monitoring for candidate significant bat maternity colony features according to the March 2010 versions of Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, 2010). In addition to passive acoustic monitoring, active visual and acoustic monitoring was undertaken to establish if any snags monitored may contain bat maternity colonies.

The UTM coordinates of the monitoring stations for bat maternity colony features are provided in Table 1. A map showing the locations of these monitoring stations is provided in Appendix B.

**Table 1. Locations of Bat Maternity Colony Monitoring Stations**

Bat Maternity Colony Feature	Monitoring Station ID	UTMs of Monitoring Station	
		Easting	Northing
<b>BMC-01</b>	BAT-014	445200	4817239
<b>BMC-07</b>	BAT-004	447444	4813499
<b>BMC-08</b>	BAT-008	447880	4821033
<b>BMC-13</b>	BAT-010	449246	4811056

The following description of methods for these surveys was provided in the 2012 Bat Monitoring Report and Environmental Impact Study (NRSI, 2012).

#### Through-the-night Acoustic Bat Monitoring

In accordance with the MNR guidance document (MNR, 2010), monitoring should be conducted in the month of June, beginning at dusk and continuing for 5 hours. In 2010 monitoring began on the night of June 2/3 and lasted through the night of June 26/27. In 2011 monitoring began on the night of June 09/10 and lasted through the night of July 6/7. On some of the monitoring nights, monitoring occurred at more than one station on the same night. While monitoring was typically conducted for more than 5 hours each night, the data was analyzed using the results from dusk until 5 hours after (2000–0100hrs).

On each monitoring night, a Pettersson D240X ultrasound bat detector was paired with a portable computer to record all bat activity. This monitoring system was powered by gel deep cycle batteries and left to record between 2 and 5 nights of data at a time. The portable computer recorded wave files at a moderate sampling rate of 22.2 kHz/sec, which typically provides ample sonogram resolution to identify the call sonograms of Ontario's bat species.

Each passive monitoring station was designed to record both Heterodyne and Time Expansion data simultaneously to allow for a full analysis of activity in the vicinity of monitoring stations. Although Time Expansion records broadband data, the Heterodyne setting typically records narrowband data within approximately 5kHz of the recording frequency. Based on call frequencies of Ontario bat species, a recording frequency of 35kHz was chosen

to provide the most accurate representation of bat abundance through the study area. Representative calls of all of Ontario's bat species demonstrate that at least some of the call will overlap with the 30 to 40kHz detectable range. It is possible that some distant or uncharacteristic calls were not picked up by the Heterodyne recordings, however when paired with the broadband recordings of the Time Expansion data, these data are expected to give an accurate representation of the bat activity and species found at each monitoring station.

### Visual Bat Surveys

Active visual and acoustic surveys were conducted at the same location as through-the-night acoustic monitoring stations. Surveys were conducted between sunset and midnight, and consisted of ten minute surveys at each point count location. During each survey, the observer used the manual trigger setting of the Pettersson D240X ultrasound detector, paired with an audio recorder, to record bat calls while listening to and observing the total number of bat passes during the survey.

The Heterodyne and species data collected from these visual monitoring surveys were analyzed separately from the data collected from through-the-night acoustic monitoring.

## **Amphibian Woodland Breeding Habitat**

Candidate amphibian woodland breeding habitat features were evaluated through the completion of pre-construction surveys according to the following protocol.

The general locations of vernal pools were identified by ELC vegetation polygons but a more detailed assessment of habitat conditions was made as follows. The first step was to characterize vernal pools within the 120 m Area of Investigation during the day in April 2012, early in the amphibian breeding season. The following characteristics were documented:

- a) UTM;
- b) Dimensions (i.e., length x width);
- c) Maximum water depth;
- d) Presence of emergent and submergent vegetation: type and amount;
- e) Presence of fringing shrubs: type and amount;
- f) Presence of logs (size, quantity) within or near vernal pools;
- g) Apparent water quality (visual observations only);
- h) Disturbance nearby;
- i) Any amphibian observations; and
- j) Search for salamander or frog egg masses if conditions appear suitable.

Vernal pools that are too shallow, small or degraded to have much potential for amphibian breeding were identified and removed from further study or consideration. Pools that contain sufficient water depth and habitat conditions were investigated further.

Surveys to target vocalizing amphibians (i.e., frogs) were conducted using the following protocol. Each feature was surveyed three times per year between April 1<sup>st</sup> and June 30<sup>th</sup> (preferably April, May and June, but surveys may begin in March in the case of an early spring), with at least 15 days between each survey. Monitoring stations were established at the edge of vernal pools or ponds that potentially contain breeding amphibians during vernal pool habitat characterization as described above. The UTMs of the monitoring stations for amphibian woodland breeding habitat features AWO-11 and AWO-13 are provided in Table 2. Maps showing the locations of these monitoring stations are provided in Appendix B.

**Table 2. Locations of Amphibian Woodland Breeding Habitat Monitoring Stations**

Amphibian Woodland Breeding Habitat Feature	UTMs of Monitoring Station	
	Easting	Northing
<b>AWO-11</b>	451781	4819330
<b>AWO-13</b>	446950	4812325

Surveys were conducted between one half-hour after sunset and 2:00 am and, to the extent possible, during evenings with little wind and minimum night air temperatures of 5°C (41°F), 10°C (50°F) and 14°C (57°F) for each of the three respective survey periods. An effort was made to conduct the third survey when the minimum night air temperature is 17°C however it is recognized that this may not be possible in all years. To the extent possible, surveys were conducted on nights that were clear, cloudy, damp, foggy, or have light rain are suitable. Moderate to heavy rainfall was avoided. After waiting one minute upon arrival at a station to allow for amphibians to start calling again after being disturbed, a 3-minute listening survey was completed at each station. Surveys were conducted using an unlimited distance semi-circular sampling area in which the estimated distance and direction of calling amphibian species was recorded, indicating whether calls are originating from within or beyond the defined 100 m area surveyed. Call counts were recorded using the codes established for the Marsh Monitoring Protocol.

Surveys to target non-vocalizing amphibians (i.e., salamanders) were conducted using one of the following three protocols:

#### Adult Salamander Survey

Nocturnal surveys may be completed for adult salamanders if the amphibian calling surveys can be done either on, or within two days of a relatively warm rainy night in late March to early April. Adult salamanders will remain in the pond for several days following a warm rain. Headlamps should be used to search waters in the pond and a D-ring dipnet used to scoop sample leaf litter on the bottom of ponds. Ten representative scoops should be taken at each site. The litter in each scoop should be carefully searched for the presence of salamanders. Any salamanders found should be identified, measured and released.

#### Egg Mass Survey

Egg mass surveys for salamanders may be conducted in conjunction with vernal pool habitat characterization as described above. Egg mass searches should be conducted during daylight hours in early spring with the first visit in March after a relatively warm rain. If eggs are not found on the first survey, a second egg mass survey should be conducted in conjunction with the amphibian call survey in April. Area searches generally include walking within or along the perimeter of the vernal pool/wetland looking for egg masses, carefully checking any submerged sticks or shrubs standing in the water to which eggs may be attached. A minimum search effort of 30 minutes should be applied for each station, or a complete check of locations where egg masses may occur, whichever is less. The number of individuals or egg masses of each amphibian species observed should be recorded and the life stage (e.g., egg mass or adult) noted.

#### Larval Survey

Larval surveys may be conducted in May or June to search for presence of larvae of salamanders. A D-ring dipnet should be used to scoop sample leaf litter on the bottom of ponds. Ten representative scoops should be taken at each site. The litter in each scoop should be placed into a bucket and carefully searched for the presence of salamander larvae. Any larvae found should be identified, measured and released. Any other encountered amphibians should be recorded and released. Area searches for adult or transformed salamanders should also be conducted by overturning logs and walking along the perimeter of the vernal pool or wetland. A minimum search

effort of 30 minutes should be applied for each station, or a complete check of locations where larvae may occur, whichever is less. Larvae should be identified using a field guide or key (e.g., [http://www.umesc.usgs.gov/terrestrial/amphibians/mknutson\\_5003869\\_field\\_guide.html](http://www.umesc.usgs.gov/terrestrial/amphibians/mknutson_5003869_field_guide.html)). Water depth and other relevant characteristics of the vernal pools should be recorded. Logs or debris in the vicinity of the pools should be overturned for the presence of salamanders.

Field sheets were prepared to record weather, vernal pool conditions, UTM's, and amphibian observations as well as time and date.

Further refinements to the methods for conducting evaluation of significance surveys for candidate amphibian woodland breeding habitat features were made in consultation with MNR and subsequent to MNR confirmation of the NHA, as follows:

**Scenario 1:** If no standing water is present and no amphibians are observed during the first round of surveys targeting both vocalizing and non-vocalizing amphibians, the habitat will be considered not suitable for breeding amphibians and no further surveys for vocalizing or non-vocalizing amphibians will be required.

**Scenario 2:** If there is insufficient standing water (less than 30 cm) and no amphibians are observed during the first round of surveys targeting both vocalizing and non-vocalizing amphibians, the habitat will be considered unlikely to be Significant Wildlife Habitat for breeding amphibians and no further surveys for vocalizing or non-vocalizing amphibians will be required.

**Scenario 3:** If the first egg mass survey is completed after April 24 and no egg masses are found, no further surveys for non-vocalizing amphibians (salamanders) will be deemed necessary because the first egg mass survey is unlikely to have missed salamander eggs. First, second and third round surveys for vocalizing amphibians will continue as scheduled.

**Scenario 4:** If the first egg mass survey is completed before April 24, no egg masses are found and the habitat is considered not suitable for salamander breeding (i.e., pond is isolated in an agricultural field, or pond has less than 15 cm of water), no further surveys for non-vocalizing amphibians (salamanders) will be required because the feature is unlikely to support Significant Wildlife Habitat for breeding salamanders. First, second and third round surveys for vocalizing amphibians will continue as scheduled.

Features containing breeding population of 1 or more of the following species with at least 20 individuals will be considered significant: Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Chorus Frog, Wood Frog.

Where Significant Wildlife Habitat for woodland breeding amphibians was identified, the landscape context was evaluated to identify potential or likely movement corridors based on configuration of woodlots, hedgerows and breeding sites. The location of probable corridors was examined to determine if they occur within 120 m of a Project component.

## Amphibian Wetland Breeding Habitat

Candidate amphibian wetland breeding habitat features were evaluated through the completion of pre-construction surveys according to the following protocol.

The general locations of vernal pools were identified by ELC vegetation polygons but a more detailed assessment of habitat conditions was made as follows. The first step was to characterize vernal pools within the 120 m Area of

Investigation during the day in April 2012, early in the amphibian breeding season. The following characteristics were documented:

- a) UTM;
- b) Dimensions (i.e., length x width);
- c) Maximum water depth;
- d) Presence of emergent and submergent vegetation: type and amount;
- e) Presence of fringing shrubs: type and amount;
- f) Presence of logs (size, quantity) within or near vernal pools;
- g) Apparent water quality (visual observations only);
- h) Disturbance nearby;
- i) Any amphibian observations; and
- j) Search for salamander or frog egg masses if conditions appear suitable.

Vernal pools that are too shallow, small or degraded to have much potential for amphibian breeding were identified and removed from further study or consideration. Pools that contain sufficient water depth and habitat conditions were investigated further.

Surveys to target vocalizing amphibians (i.e., frogs) were conducted using the following protocol. Each feature was surveyed three times per year between April 1<sup>st</sup> and June 30<sup>th</sup> (preferably April, May and June, but surveys may begin in March in the case of an early spring), with at least 15 days between each survey. Monitoring stations were established at the edge of vernal pools or ponds that potentially contain breeding amphibians during vernal pool habitat characterization as described above. The UTMs of the monitoring station for amphibian wetland breeding habitat feature AWE-01 are provided in Table 3. A map showing the location of this monitoring station is provided in Appendix B.

**Table 3. Location of Amphibian Wetland Breeding Habitat Monitoring Station**

Amphibian Wetland Breeding Habitat Feature	UTMs of Monitoring Station	
	Easting	Northing
AWE-01	446027	4816658

Surveys were conducted between one half-hour after sunset and 2:00 am and, to the extent possible, during evenings with little wind and minimum night air temperatures of 5°C (41°F), 10°C (50°F) and 14°C (57°F) for each of the three respective survey periods. An effort was made to conduct the third survey when the minimum night air temperature is 17°C however it is recognized that this may not be possible in all years. To the extent possible, surveys were conducted on nights that were clear, cloudy, damp, foggy, or have light rain are suitable. Moderate to heavy rainfall was avoided. After waiting one minute upon arrival at a station to allow for amphibians to start calling again after being disturbed, a 3-minute listening survey was completed at each station. Surveys were conducted using an unlimited distance semi-circular sampling area in which the estimated distance and direction of calling amphibian species was recorded, indicating whether calls are originating from within or beyond the defined 100 m area surveyed. Call counts were recorded using the codes established for the Marsh Monitoring Protocol.

Surveys to target non-vocalizing amphibians (i.e., salamanders) were conducted using one of the following three protocols:

#### Adult Salamander Survey

Nocturnal surveys may be completed for adult salamanders if the amphibian calling surveys can be done either on, or within two days of a relatively warm rainy night in late March to early April. Adult salamanders will remain in the

pond for several days following a warm rain. Headlamps should be used to search waters in the pond and a D-ring dipnet used to scoop sample leaf litter on the bottom of ponds. Ten representative scoops should be taken at each site. The litter in each scoop should be carefully searched for the presence of salamanders. Any salamanders found should be identified, measured and released.

### Egg Mass Survey

Egg mass surveys for salamanders may be conducted in conjunction with vernal pool habitat characterization as described above. Egg mass searches should be conducted during daylight hours in early spring with the first visit in March after a relatively warm rain. If eggs are not found on the first survey, a second egg mass survey should be conducted in conjunction with the amphibian call survey in April. Area searches generally include walking within or along the perimeter of the vernal pool/wetland looking for egg masses, carefully checking any submerged sticks or shrubs standing in the water to which eggs may be attached. A minimum search effort of 30 minutes should be applied for each station, or a complete check of locations where egg masses may occur, whichever is less. The number of individuals or egg masses of each amphibian species observed should be recorded and the life stage (e.g., egg mass or adult) noted.

### Larval Survey

Larval surveys may be conducted in May or June to search for presence of larvae of salamanders. A D-ring dipnet should be used to scoop sample leaf litter on the bottom of ponds. Ten representative scoops should be taken at each site. The litter in each scoop should be placed into a bucket and carefully searched for the presence of salamander larvae. Any larvae found should be identified, measured and released. Any other encountered amphibians should be recorded and released. Area searches for adult or transformed salamanders should also be conducted by overturning logs and walking along the perimeter of the vernal pool or wetland. A minimum search effort of 30 minutes should be applied for each station, or a complete check of locations where larvae may occur, whichever is less. Larvae should be identified using a field guide or key (e.g., [http://www.umesc.usgs.gov/terrestrial/amphibians/mkknutson\\_5003869\\_field\\_guide.html](http://www.umesc.usgs.gov/terrestrial/amphibians/mkknutson_5003869_field_guide.html)). Water depth and other relevant characteristics of the vernal pools should be recorded. Logs or debris in the vicinity of the pools should be overturned for the presence of salamanders.

Field sheets were prepared to record weather, vernal pool conditions, UTM's, and amphibian observations as well as time and date.

Further refinements to the methods for conducting evaluation of significance surveys for candidate amphibian wetland breeding habitat features were made in consultation with MNR and subsequent to MNR confirmation of the NHA, as follows:

**Scenario 1:** If no standing water is present and no amphibians are observed during the first round of surveys targeting both vocalizing and non-vocalizing amphibians, the habitat will be considered not suitable for breeding amphibians and no further surveys for vocalizing or non-vocalizing amphibians will be required.

**Scenario 2:** If there is insufficient standing water (less than 30 cm) and no amphibians are observed during the first round of surveys targeting both vocalizing and non-vocalizing amphibians, the habitat will be considered unlikely to be Significant Wildlife Habitat for breeding amphibians and no further surveys for vocalizing or non-vocalizing amphibians will be required.

**Scenario 3:** If the first egg mass survey is completed after April 24 and no egg masses are found, no further surveys for non-vocalizing amphibians (salamanders) will be deemed necessary because the first egg mass survey is unlikely to have missed salamander eggs. First, second and third round surveys for vocalizing amphibians will continue as scheduled.

**Scenario 4:** If the first egg mass survey is completed before April 24, no egg masses are found and the habitat is considered not suitable for salamander breeding (i.e., pond is isolated in an agricultural field, or pond has less than 15 cm of water), no further surveys for non-vocalizing amphibians (salamanders) will be required because the feature is unlikely to support Significant Wildlife Habitat for breeding salamanders. First, second and third round surveys for vocalizing amphibians will continue as scheduled.

Features containing breeding population of 2 or more of the following species with at least 20 individuals are to be considered significant: Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Chorus Frog, Northern Leopard Frog, Pickerel Frog, Green Frog or Mink Frog. Any wetland with confirmed breeding by American Bullfrog is to be considered significant.

Where Significant Wildlife Habitat for wetland breeding amphibians was identified, the landscape context was evaluated to identify potential or likely movement corridors based on configuration of woodlots, hedgerows and breeding sites. The location of probable corridors was examined to determine if they occur within 120 m of a Project component.

### Red-headed Woodpecker Habitat

Candidate habitats for woodland breeding bird Species of Conservation Concern were evaluated through the completion of pre-construction surveys according to the following protocol.

Breeding bird surveys were conducted according to the Forest Bird Monitoring Protocol, with additions from the Ontario Breeding Bird Atlas Methods as follows. Point count stations within the woodland were located within the area of disturbance, and at least 200 m from the forest edge, where forest interior existed. Stations within large woodlands were at least 250 m apart. For wooded areas with no forest interior (less than 200 m from edge), point counts were located in the centre of the forest patch. For wooded features crossing roadways, point counts were located 125 m from the right-of-way on each side of the roadway, allowing 250 m between stations. Locations of point count stations were marked on an aerial map, flagged in the field, and UTM data were recorded. The UTM coordinates of the point count stations for feature SCB-02 are provided in Table 4. A map showing the locations of these monitoring stations is provided in Appendix B.

**Table 4. Locations of Red-headed Woodpecker Habitat Monitoring Stations**

Red-headed Woodpecker Habitat Feature	Point Count Station	UTMs of Point Count Station	
		Easting	Northing
SCB-02	1	459472	4817564
	2	459460	4817800

Three separate surveys were conducted at each station. Surveys were completed between May 24 and July 10, with at least 10 days between each visit. Surveys were conducted in the morning, between one half hour before dawn and 10:00 a.m., when weather conditions were without precipitation and winds were calm. Weather conditions (temperature, sky conditions, wind speed and direction) at each point count were recorded.

Each point count was composed of two 5-minute intervals. During each point count, all signs and vocalizations of birds were recorded as well as the direction from which the call came. The approximate location of the bird species, breeding activity, and flyovers were recorded on station maps. Surveyors also assessed the distance of the calls, either within a 50 m radius, between 50 to 100 m, or greater than 100 m from the point count location. Habitats within 100 m of the point count station were evaluated using the habitat coding system from the Ontario Nest Records Scheme to provide station-specific habitat information.

Forest areas identified to contain suitable breeding habitat for bird Species of Conservation Concern were considered to be significant if bird Species of Conservation Concern were identified using the area during the breeding season.

During post-construction surveys, trees and utility poles in the vicinity of SCB-02 should also be examined for signs of nesting Red-headed Woodpecker.

# Appendix B

## Maps of Survey Locations



Figure 1

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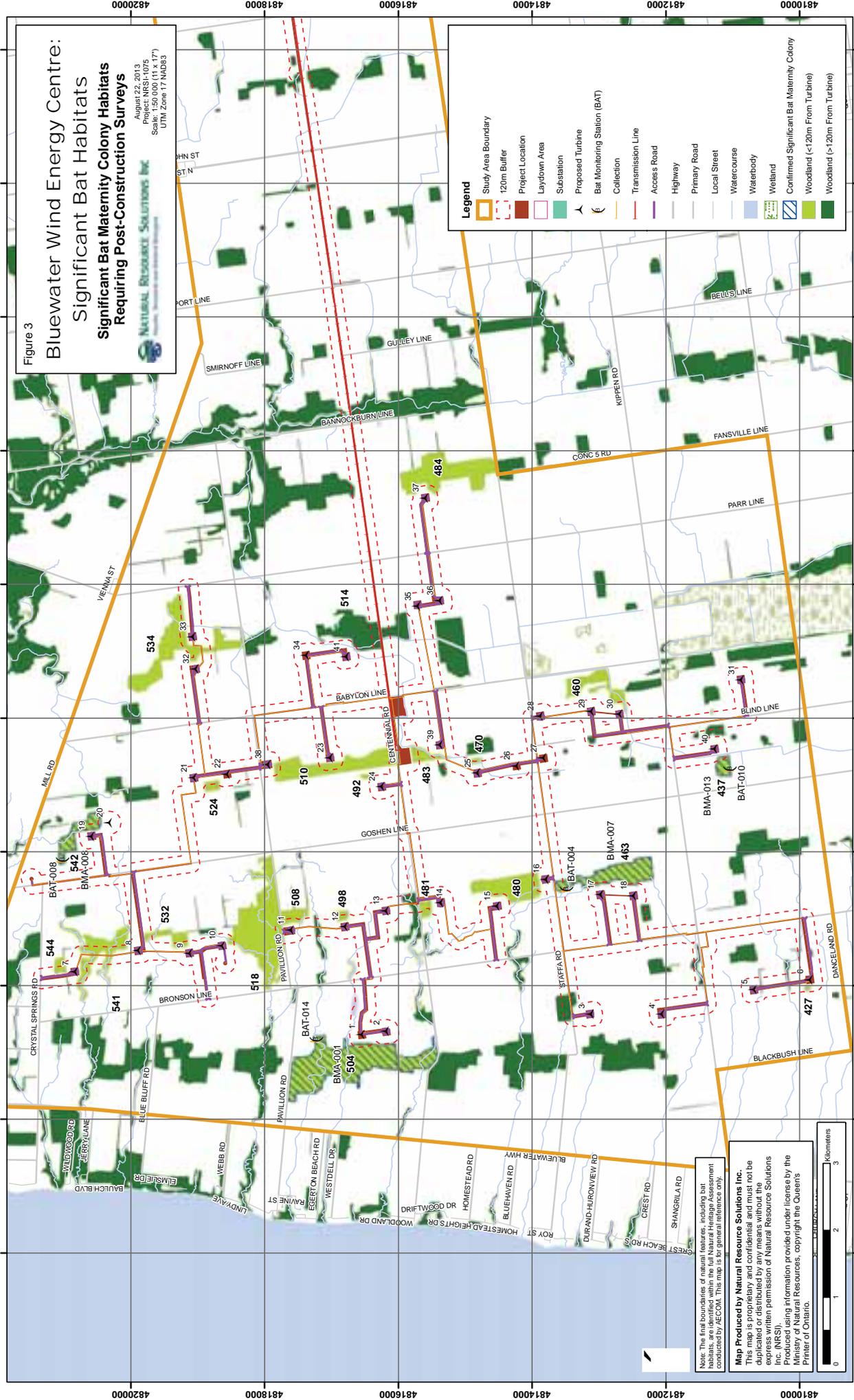
**Figure 3**  
**Bluewater Wind Energy Centre:**  
**Significant Bat Habitats**  
**Requiring Post-Construction Surveys**

August 22, 2013  
 Project: NRS-1075  
 Scale: 1:50,000 (11 x 17")  
 UTM Zone 17 NAD83



**Legend**

- Study Area Boundary
- 120m Buffer
- Project Location
- Laydown Area
- Substation
- Proposed Turbine
- Bat Monitoring Station (BAT)
- Collection
- Transmission Line
- Access Road
- Highway
- Primary Road
- Local Street
- Watercourse
- Waterbody
- Wetland
- Confirmed Significant Bat Maternity Colony
- Woodland (<120m From Turbine)
- Woodland (>120m From Turbine)



Note: The final boundaries of natural features, including bat habitats, are to be determined within the full Natural Heritage Assessment conducted by RECORN. This map is for general reference only.

**Map Produced by Natural Resource Solutions Inc.**  
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- Legend**
- Wind Energy Centre Study Area
  - Transmission Line Study Area
  - 150m Area of Investigation
  - Roads
  - Railway
  - Access Roads
  - Watercourse (ABCA, SCRCA)
  - Disturbance Area
  - Substation

- Project Location**
- GE Turbine
  - MET Tower
  - Collection Lines
  - Access Roads
  - Disturbance Area
  - Substation
- Location of Point Count**
- Denied
  - Granted
  - Red-headed Woodpecker Habitat
  - Significant Wildlife Habitat

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 February 2013

**Blawie Wind Energy Centre EEMP**  
**Significant Wildlife Habitat**  
**Field Map - SCB-02**  
 February 2013  
 Project 00155032

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Figure 4



- Legend**
- Wind Energy Centre Study Area
  - Transmission Line Study Area
  - 150m Area of Investigation
  - Roads
  - Railway
  - Access Roads
  - Watercourse (ABCA, SCRCA)
  - Disturbance Area
  - Substation

- Project Location**
- GE Turbine
  - MET Tower
  - Collection Lines
  - Access Roads
  - Disturbance Area
  - Substation
- Location of Point Count**
- Denied
  - Granted
  - Red-headed Woodpecker Habitat
  - Significant Wildlife Habitat

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**Blawie Wind Energy Centre EEMP**  
**Significant Wildlife Habitat**  
**Field Map - SCB-02**  
 February 2013  
 Project 00155032

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Figure 4



- Legend**
- Wind Energy Centre Study Area
  - Transmission Line Study Area
  - 200m Area of Investigation
  - Roads
  - Railway
  - Natural Feature
  - Watercourse (MCA, SC, CCA)
  - Substation
  - Project Location
  - GE Turbine
  - NET Tower
  - Collection Lines
  - Access Roads
  - Transmission Line
  - Transmission Line
  - Transmission Line

- Properties**
- Decided
  - Granted
  - Amended
  - Withdrawn
  - Significant Wildlife Habitat
  - Wildlife Habitat
- Location of Point Count**

Blount Wind Energy Centre EEMP  
**Significant Wildlife Habitat**  
 Field Map - AWE-01  
 February 2013  
 Project 6010001

Scale: 1:10,000  
 0 275.55 11 165 22  
 METERS

Figure 5

# Appendix C

## Mortality Monitoring Forms

# Overview of templates for Natural Heritage Assessment Reports and Post-construction Mortality Monitoring Reports

Report the data from these forms onto the provided Excel templates. Each form correspond to at least one Excel sheet. Refer to the instructions in the Excel templates and at the top of each form.

## **Post-construction Field Forms**

1. Site Description Form (Carcass searches)
2. Site Description and Carcass  
Distribution Form (Carcass searches)
3. Bird/Bat Carcass Searches Form
4. Searcher Efficiency Trials Form
5. Searcher Efficiency Trials Summary Form
6. Carcass Removal Trials Form
7. Carcass Removal Trials Summary Form

# Wind Energy Bird and Bat Monitoring Database (post-construction)

## 1. Site Description Form (Carcass Searches)

Complete one Site Description Form for each turbine search (i.e. Each turbine sampled, once per season). Every turbine should have a unique turbine number, also referenced in other field sheets. Report each Site Description Form as a record in the data template (site\_descr\_carcass).

**Project name :** \_\_\_\_\_

**Province :** \_\_\_\_\_ **Turbine number :** \_\_\_\_\_

**Date completed (dd/mm/yyyy) :** \_\_\_\_/\_\_\_\_/20\_\_\_\_

**UTM coordinates of the turbine :**

**Zone:** \_\_\_\_\_ **Easting:** \_\_\_\_\_ **Northing :** \_\_\_\_\_

**Slope :** \_\_\_\_\_ ° **Orientation of slope :** \_\_\_\_\_ (e.g., SSW)

**Required survey area :** \_\_\_\_\_ m<sup>2</sup> (e.g. 7,854 m<sup>2</sup> for 50 m radius)

**Transect separation :** \_\_\_\_\_ m

**Habitat description :**

**Distance from the turbine to the following features:**

Distance to nearest wood : \_\_\_\_\_ m

Distance to nearest shoreline : \_\_\_\_\_ m

Distance to nearest wetland : \_\_\_\_\_ m

Distance to nearest Significant Wildlife Habitat : \_\_\_\_\_ m

Type of Significant Wildlife Habitat (eg. hibernacula): \_\_\_\_\_

**Turbine details :**

Power : \_\_\_\_\_ Megawatts

Turbine height (from ground to top of nacelle) : \_\_\_\_\_ m

Turbine blade diameter : \_\_\_\_\_ m

# Wind Energy Bird and Bat Monitoring Database (post-construction)

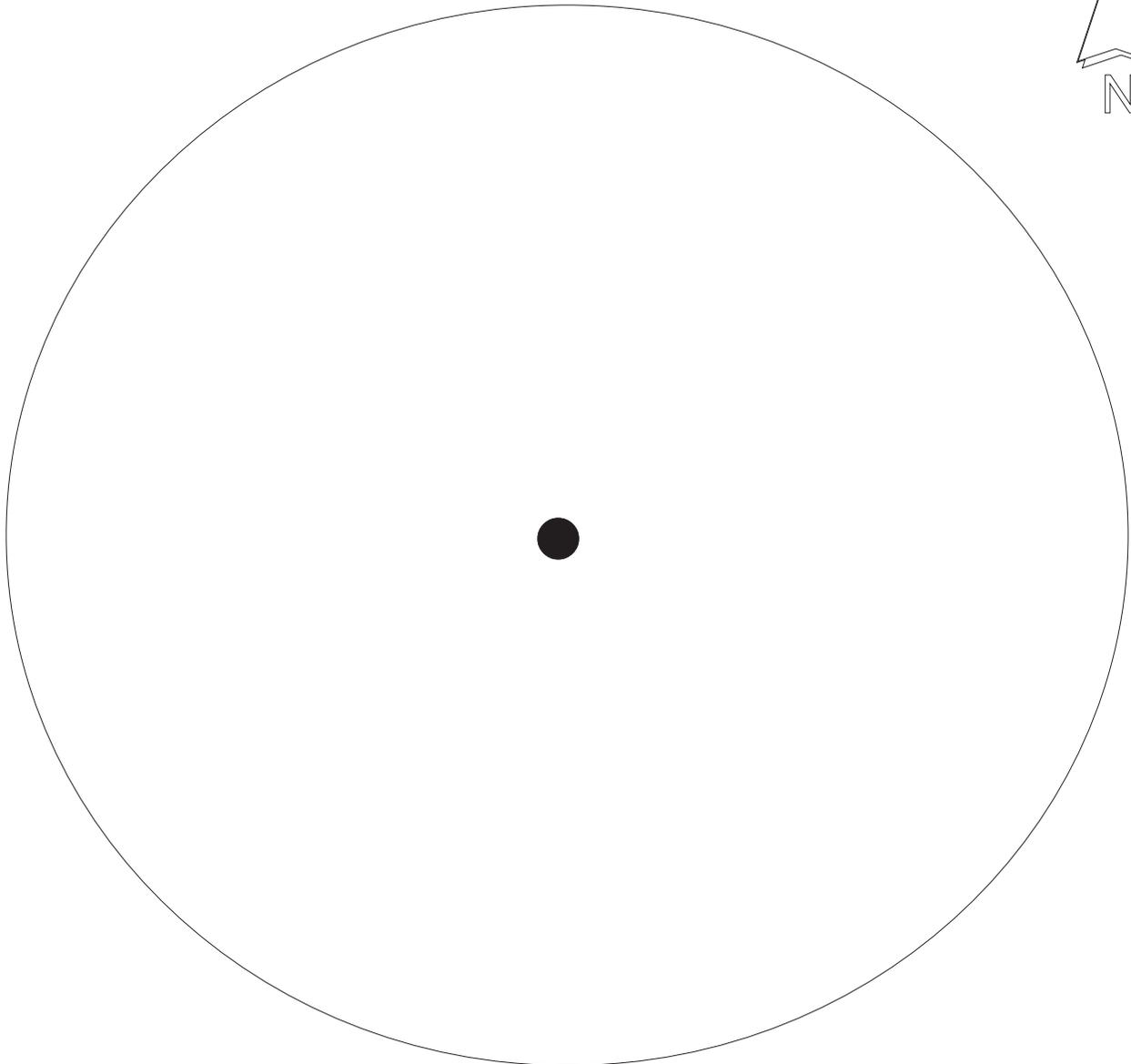
## 2. Site Description and Carcass Distribution Form (Carcass Searches)

Map the search plot, indicating visibility classes, substrate, carcass locations and area searched  
This form should provided for information with the reports, and does not contain information that  
needs to be transfered to the Excel data templates.

Project name: \_\_\_\_\_

Site number : \_\_\_\_\_

Year : \_\_\_\_\_







# Wind Energy Bird and Bat Monitoring Database (post-construction)

## 5. Searcher Efficiency Trials Summary Form

Project name: \_\_\_\_\_ Year : \_\_\_\_\_

### Spring (May-June)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Spring Total					100%	

### Summer (July-August)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Summer Total					100%	

### Fall (September-October)

Searcher	Number of carcasses placed	Number scavenged	Number found	Proportion found	Proportion turbines searched	Weighted searcher efficiency Se
Fall Total					100%	



# Wind Energy Bird and Bat Monitoring Database (post-construction)

## 7. Carcass Removal Trials Summary Form

Project name: \_\_\_\_\_ Year : \_\_\_\_\_

### Spring (May-June)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction SC
		N1	N2	N3	

Spring Total

### Summer (July-August)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction SC
		N1	N2	N3	

Summer Total

### Fall (September-October)

Turbine Number	Number of carcasses placed (N0)	Number of carcasses found per visit			Scavenger correction Sc
		N1	N2	N3	

Fall Total