

Grand Bend Wind Farm
Environmental Effects Monitoring Plan
for Birds and Bats Draft Report

Grand Bend Wind Limited Partnership,
c/o Northland Power Inc.



NEEGAN BURNSIDE

August 2012

**Grand Bend Wind Farm
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for Birds and Bats Draft Report**

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Grand Bend Wind Farm Limited Partnership

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Record of Revisions

Revision	Date	Description
0	August 14, 2012	Initial Submission to the Ministry of Natural Resources ("MNR")
0	August 27, 2012	Initial Draft Submission to Municipal and Aboriginal Communities as well as Selected Government Agencies

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Executive Summary

The Grand Bend Wind Limited Partnership, c/o Northland Power Inc. (“Northland”) is proposing to develop, construct and operate a 100 MW wind facility located north of Grand Bend, Ontario. An application for approval is being prepared under Ontario Regulation 359/09 of the *Environmental Protection Act*. The project is classified as a Class 4 Wind facility under the Regulation. The Grand Bend Wind Farm (“the Project”) is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County.

The basic project components will include up to 48 turbines (Siemens SWT-2.3-113 direct drive wind turbine generators with a total name plate capacity of 100 MW), turbine access roads, a 36 kV electrical collection system, substation and a new transmission line within municipal road Right-Of-Ways (“ROWs”) along Rodgerville Road, Line 17 and Road 183 with connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station. During construction temporary components will include access roads and work/storage areas at the turbine locations and transmission connections.

Under Section 23.1 of O.Reg. 359/09, a plan is required for post-construction monitoring of potential effects on birds and bats in accordance with the following guidance documents:

- Birds and Bird Habitats: Guidelines for Wind Power Projects (MNR, December, 2011); and,
- Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, July 2011).

The plan includes an assessment of potential negative effects, performance objectives, a mitigation strategy, post-construction monitoring and contingency measures.

In accordance with current regulatory guidelines (MNR, 2011a), the mortality threshold for bats has been set at ten bats per turbine, per year (averaged across the site). For birds the mortality threshold is as follows:

- 14 birds/turbine/year at individual turbines or turbine groups;
- 0.2 raptors/turbine/year (all raptors) across a wind power project;
- 0.1 raptors/turbine/year (provincially tracked raptors) across a wind power project; or,
- 2 raptors/wind power project (<10 turbines); as well as,
- Single event thresholds of 10 or more birds at any one turbine or 33 or more birds across the entire facility.

Post-construction monitoring will be undertaken to confirm that performance standards are met and will consist of:

- regular bird and bat mortality surveys around specific wind turbines;
- monitoring of bird and bat carcass removal rate by scavengers (or other means);
- monitoring of searcher efficiency (i.e. number of bird and bat fatalities present that are actually detected by surveyors); and,
- an additional 3 years of effectiveness monitoring where mitigation is applied for bats and an additional 3 years of monitoring for birds..

For bats, operational mitigation has been pre-determined by the MNR and involves the following:

- Wind turbine cut-in speed will be changed to 5.5 m/s (measured at hub height) or feathering of wind turbine blades when wind speeds are below 5.5 m/s.
- This change will be effective from July 15 to September 30 each year for the duration of the project.
- If the above mitigation is require then an additional 3 years of effectiveness monitoring will be commenced, beginning from the time turbine operations were altered.

If bird mortality thresholds are exceeded, the following measures will be undertaken:

- For exceedances of the annual mortality thresholds:
 - Two years of scoped mortality and cause and effects monitoring will be undertaken. This may be followed by operational mitigation (e.g., blade feathering or turbines shut-down during specified periods) if significant annual mortality persists.
- For exceedances of the single significant bird mortality event:
 - Immediate action will be undertaken regardless of the location of the turbine in relation to bird SWH.

If significant mortality continues to be experienced for either birds or bats subsequent to the implementation of operational mitigation, contingency measures will be enacted. Contingency plans will be flexible to allow for an appropriate response to the problem identified. Any actions will be discussed in detail with the MNR prior to initiation.

The monitoring program described in this report meets the requirements for monitoring under O.Reg. 359/09 and under MNR bird and bat guidance documents. The program is designed to be flexible and allow for adaptive changes, if necessary.

With this Environmental Effects and Monitoring Plan, any negative impacts on birds and bats can be identified and appropriately addressed.

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Glossary of Terms

BMC	Bat Maternal Colony
EEMP	Environmental Effects Monitoring Plan
EIS	Environmental Impact Study
ELC	Ecological Land Classification
EOS	Evaluation of Significance
MNR	Ministry of Natural Resources
NHA	Natural Heritage Assessment
PSW	Provincially Significant Wetland
SWH	Significant Wildlife Habitat

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1.0 Introduction

The Grand Bend Wind Limited Partnership, c/o Northland Power Inc. (“Northland”) is proposing to develop, construct and operate a 100 MW wind facility located north of Grand Bend, Ontario. An application for approval is being prepared under Ontario Regulation 359/09 of the *Environmental Protection Act*. The project is classified as a Class 4 Wind facility under the Regulation. The Grand Bend Wind Farm (“the Project”) is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County. The project location and study area is provided in **Figure 1 of Appendix A**.

The basic project components will include up to 48 turbines (Siemens SWT-2.3-113 direct drive wind turbine generators with a total name plate capacity of 100 MW), turbine access roads, a 36 kV electrical collection system, substation and a new transmission line within municipal road Right-Of-Ways (“ROWs”) along Rodgerville Road, Line 17 and Road 183 with connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station. During construction temporary components will include access roads and work/storage areas at the turbine locations and transmission connections.

Under Section 23.1 of O.Reg. 359/09, a plan is required for post-construction monitoring of potential effects on birds and bats in accordance with the following guidance documents:

- Birds and Bird Habitats: Guidelines for Wind Power Projects (MNR, December, 2011); and,
- Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, July 2011).

The plan must provide:

- A summary of all potential negative environmental effects which might be caused by the project;
- Performance objectives associated with mitigation measures designed to reduce negative effects;
- A description of all mitigation strategies;
- A description of monitoring to be undertaken during project operation; and,
- Contingency measures that will be undertaken should monitoring reveal that mitigation measures do not meet performance objectives.

The purpose of this report is to provide a plan for monitoring post-construction effects on bird, bats and other significant natural features.

This report is intended to meet the requirements of Section 23.1. Monitoring requirements associated with other natural heritage features (e.g., Significant Wetlands, Significant Woodlands and Significant Wildlife Habitat) are addressed separately within the Natural Heritage Assessment Environmental Impact Study Report and the Design and Operations Report.

1.1 Project Location

The proposed Project is located in Huron County, spanning the lower-tier municipalities of Bluewater and South Huron as well as a portion of Huron East and the municipality of West Perth in Perth County. The Project Study Area, shown in **Appendix A, Figure 1**, is bounded by:

- The Bluewater Highway (Highway 21) to the west;
- Main Street East/Grand Bend Line to the south;
- Blackbush and Shipka Lines with a small section of the study area in the central section of the project extending to Bronson Line and to the east;
- Staffa Road to the north; and,
- A preferred transmission line route, as described below.

Two routing options were originally studied, a northern route and a southern route, as described in the Records Review Report (Neegan Burnside, 2012). The northern route was identified as having fewer natural heritage as well as social, aesthetic and technical constraints and was thus selected as the preferred route. This route runs from a transformer station on Lot 14, Concession 13, former Hay Township, and follows Sararas/Rodgerville Road to Line 17 and Road 183, connecting to the existing 230 kV Hydro One transmission line just south of the Seaforth Transformer Station ("TS"). The southern route was discarded as an option and was not studied any further.

O. Reg. 359/09 defines the Project Location as:

"a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project."

For the purposes of this Project, the Project Location includes the footprint of the facility components, plus any temporary work and storage locations. The boundary of the Project Location is used for defining setback and site investigation distances according to O.Reg. 359/09. The buildable area, which includes the footprint of the facility components, plus any temporary work and storage locations, will be staked. All

construction and installation activities will be conducted within these designated areas; this includes construction vehicles and personnel. Similarly, all installation activities related to collector lines within the municipal and provincial road allowance will be contained within the boundaries of the road allowance.

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2.0 Findings of the Natural Heritage Assessment

Under O.Reg. 359/09, a Natural Heritage Assessment is a required component of a REA Application for a Class 4 Wind Facility. The Natural Heritage Assessment is to be completed in four stages as follows:

- Stage 1: Records Review;
- Stage 2: Site Investigation;
- Stage 3: Evaluation of Significance; and,
- Stage 4: Environmental Impact Study.

With respect to the Grand Bend Wind Farm, all four stages were completed. Several significant natural heritage features were identified within 120 m of the Project Location. Potential impacts, mitigation, performance objectives, monitoring plans and contingency measures for each of these features were identified in the Environmental Impact Study ("EIS").

In accordance with Section 23.1 of O.Reg. 359/09, post-construction monitoring for birds and bats are to be discussed separately. The measures provided in this report are also summarized in the Design and Operations Report and EIS (Neegan Burnside, 2012).

The purpose of post-construction monitoring is to confirm that the proposed mitigation is effective and, if not, to provide a contingency plan to bring the project back into conformity with all applicable natural heritage regulations.

3.0 Environmental Effects Monitoring Plan

The Environmental Effects Monitoring Plan for birds and bats is described in detail in Sections 4.0 through 8.0 of this report and summarized in Table 9.1

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4.0 Potential Negative Effects

4.1 Bats

At existing wind power facilities in Ontario and across North America, bat mortality has been observed. Typically, this mortality has been shown to be relatively minimal and usually varies from <1 to 50 bat fatalities/turbine/year (MNR 2006). Based on information collected to date, it appears as though most bat fatalities at wind power facilities occur in the late summer and fall, during the migration period for long-distance migratory bats (i.e., hoary bat, eastern red bat, silver haired bat). These species appear to be most vulnerable.

Bats may also be indirectly affected by wind power projects through effects on habitat and behaviour.

Bat migration patterns are not well understood in Ontario. Only one migration stopover area has been identified to date. It is located in the Long Point Region on Lake Ontario, well away from the Grand Bend area. Due to the uncertainty associated with bat migration, there is potential for negative effects, including significant mortality to occur.

In addition, ten areas were identified through the Natural Heritage Assessment as being candidate Bat Maternal Colony habitats. These are being treated as significant until more detailed studies are completed in the spring of 2013. Bat Maternal Colonies are most active in June. During this period, there is also potential for mortality to occur.

4.2 Birds

Data collected through post-construction monitoring of operational wind power facilities in Ontario and elsewhere around the world, shows very low numbers of bird fatalities (MNR 2011b). Data from Ontario and the United States indicates that approximately 2.5 birds are killed by individual turbines each year. This is very low compared to other existing sources of human caused avian mortality such as large glass office buildings and house cats, as examples. Bird mortality can occur through collisions with turbine blades and towers, guy wires, meteorological towers and maintenance vehicles. Mortality rates and patterns are affected by density and behavior of birds found in the area, the presence of landscape features such as ridges, valleys, peninsulas and shorelines and weather conditions.

Birds may also be indirectly affected by wind power projects through effects on habitat and behaviour.

Baseline data at the Grand Bend Wind Farm site indicated that there are no significant habitats for birds within 120 m of a turbine. Bird presence in the area in general was relatively low.

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5.0 Performance Objectives

5.1 Bats

In accordance with current regulatory guidelines (MNR, 2011a), the mortality threshold for bats has been set at ten bats per turbine, per year (averaged across the site).

5.2 Birds

In accordance with current regulatory guidelines (MNR, 2011b), the mortality thresholds for birds have been set as follows:

- 14 birds/turbine/year at individual turbines or turbine groups;
- 0.2 raptors/turbine/year (all raptors) across a wind power project;
- 0.1 raptors/turbine/year (provincially tracked raptors) across a wind power project; or,
- 2 raptors/wind power project (<10 turbines).

Provincially tracked raptors are defined as raptors of provincial conservation concern by the Ministry of Natural Resources Natural Heritage Information Centre.

In addition, single significant mortality events have been reported at existing wind farms. Such an event has been defined by the MNR (2011b) as the results of any single monitoring survey in excess of:

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

6.0 Mitigation Strategy

6.1 Bats

Turbine siting was the primary method used to mitigate impacts to bats. Several studies of large commercial wind farms found that turbines located on forested ridges often resulted in significant bat mortality, particularly where openings were created in the forest (MNR, 2006). The MNR (2006) notes that bat mortality is significantly higher for wind facilities located in forested areas as opposed to grassland and agricultural areas.

The proposed wind facility location is in an open agricultural area. Turbines will not be located within a forest and the project will not result in any new openings in the forest. Topography in the area is relatively flat and there are no forested ridges present.

The MNR (2006) also quotes a study by Johnson et al. (2003b, 2004) which studied the number of bat “passes” or movements through an area in close proximity to turbines. The study found that:

“Current evidence indicates that bat mortality associated with wind farms appears to be highest in or near forests, moderate in open areas close to forests, and lowest in open grassland or farmland away from forests.”

The approach used to mitigate impacts to bats was thus to site turbines in agricultural lands as far from forested area as possible and avoid the creation of new openings within forested areas. It is therefore anticipated that performance standards will be met.

6.2 Birds

The primary strategy proposed to minimize impacts on birds was to avoid significant bird habitats to the extent possible. The project layout utilizes lands under intensive agricultural use and existing road rights-of-way. In addition, construction will be scheduled at less sensitive times of the year to avoid disturbing natural bird processes and habitat. Any habitats disturbed during construction will be restored immediately after construction.

7.0 Post-Construction Monitoring Methodologies

The objective of the post-construction monitoring program is to determine if the performance objectives described in Section 5.0 are met during project operation. Should the post construction monitoring program find that bird and bat mortality is higher than this threshold, the operational mitigation and/or contingency measures will be enacted.

Additional monitoring will also be undertaken to ensure that mitigation associated with amphibians and flora are also effective.

7.1 Bats

Post-construction monitoring will be undertaken to confirm that performance standards are met and will consist of:

- regular bat mortality surveys around specific wind turbines;
- monitoring of bat carcass removal rate by scavengers (or other means);
- monitoring of searcher efficiency (i.e. number of bat fatalities present that are actually detected by surveyors); and,
- an additional 3 years of effectiveness monitoring where mitigation is applied.

7.1.1 Timing

The following guidelines will be followed with respect to the timing of surveys:

- Post-construction monitoring will begin on May 1 of the year that the wind power project is fully operational. If full project commissioning is delayed, post-construction monitoring of the partially completed project will not be delayed for longer than one year.
- All surveys associated with the monitoring program (e.g., mortality surveys, carcass removal and searcher efficiency trials) will be conducted during the core season when bats are active (i.e., May 1 to October 31) for the first 3 years of wind turbine operation.
- Bat mortality surveys will be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1 to October 31. These surveys will be conducted in conjunction with surveys for birds, as described in Section 7.2 of this report.
- 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.

7.1.2 Carcass Searches

A sub-sample of turbines will be selected for monitoring purposes. The sub-sample will include at least 30% of the turbines in representative areas in the project location (i.e., 15 turbines if the project includes 48 turbines in total).

The sub-sample will be selected such that:

- it covers a representative sample of all habitats present;
- it includes a range of turbines across the full spatial distribution of the project;
- it focuses on turbines within minimally-vegetated areas (i.e. Visibility Classes 1 and 2, in accordance with MNR, 2011); and,
- it includes all turbines within 120 m of Bat Maternal Colony habitat.

Currently, 10 Bat Maternal Colony habitats are being treated as significant. There are nineteen turbines within 120 m of these habitats. All of these turbines will be monitored unless pre-construction surveys to be conducted in 2013 show that one or more of these habitats are not significant. If any of these habitats are found not to be significant, the adjacent turbine may be dropped from the monitoring program as long as the total number of turbines being monitored does not decrease below 15.

Table 7.1 and **Figure 2, Appendix A** show the location of turbines to be included in post-construction monitoring.

Table 7.1 Turbines to be Included in Post-Construction Surveys

Bat Maternal Colonies Treated As Significant	Associated Turbine(s)
BMC-001	T-43
BMC-002	T-37, T-38
BMC-003	T-33, T-35, T-38
BMC-004	T-29, T-30
BMC-005	T-24, T-25, T-27, T-28
BMC-006	T-21, T-22, T-23, T-24, T-25
BMC-007	T-02
BMC-008	T-42
BMC-009	T-31, T-33
BMC-010	T-17, T-18

*If Pre-construction surveys in June 2013 indicate that one or more habitats are not significant, post-construction monitoring at the associated turbine may be eliminated. Monitoring will not be reduced by any less than 15 turbines.

Based on current Ontario post-construction data, most bats 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 vegetation, active cultivation, etc., the actual area searched during the mortality surveys will be calculated at each turbine, using a GPS. 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.

The proportion of area searched will be calculated as follows:

$$P_s = \frac{\text{actual area searched}}{\pi r^2} \quad \text{where } r = 50\text{m}^2$$

Carcass searches will be conducted in accordance with the following principles:

- An area 50 m² area each turbine in the sub-sample will be searched, excluding areas with poor visibility (Visibility Class 3 and 4 as described in MNR 2011).
- 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.
- Observed fatalities will be photographed, and the species, GPS coordinates, substrate, carcass conditions, and distance and direction to the nearest turbine will be recorded along with the date, time and searcher.
- Bat carcasses in good condition may be collected and stored in a freezer for future use in searcher efficiency and/or scavenger removal trials. Persons handling bat carcasses will take reasonable precautions (e.g., gloves, tools, etc.) to protect their personal health. All searchers will ensure that they have updated rabies pre-exposure vaccinations. Bat carcasses will be placed in heavy-duty plastic bags and transported that day to a freezer, where they will be stored until required for the trials.
- Carcasses of the following species found during bat mortality searches may be sent to the Canadian Cooperative Wildlife Health Centre for analysis of White-nose Syndrome and should not be used in carcass removal or searcher efficiency trials:
 - *Myotis septentrionalis*;
 - *Myotis lucifugus*;
 - *Myotis leibii*;
 - *Perimyotis subflavus*; and,
 - *Eptesicus fuscus*.
- Tissue samples from bat carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin

migrants. Northland, or its consultants, will contact the local MNR office prior to disposing bat carcasses, to determine if this type of research is occurring in the area.

- All other bat carcasses will be left in place and noted to avoid double-counting during future searches.
- 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).
- Although all reasonable effort will be made to conduct surveys as scheduled, surveys will not be conducted if weather (e.g., lightning, severe fog) presents safety concerns. Weather conditions will be noted when surveys were not conducted as scheduled, and every attempt will be made to complete the missed survey(s) as soon as possible.
- Carcasses may be discovered incidental to formal searches. These carcasses will be processed (i.e., collected, 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 and will not be included in calculations.

7.1.3 Carcass Removal Trials

Some carcasses will be lost due to scavenging by resident wildlife before they can be counted. Levels of carcass scavenging will be determined through carcass removal trials. In these trials, carcasses will be placed at known locations around the wind turbines and monitored until they disappear. The average carcass removal time will be factored in to the estimated bat mortality.

Carcass removal trials will be conducted in accordance with the following principles:

- Scavenger trials will be conducted once per season (spring, summer and fall) and will involve 10 carcasses of bird and bat turbine fatalities, if available, or dark-coloured poultry chicks. If available, at least one raptor carcass will be used for some trials.
- Carcasses will be discreetly marked so they can be identified as study carcasses.
- Carcasses will be monitored every 3 to 4 days in conjunction with carcass searches.
- The trial will continue until all carcasses are removed or have completely decomposed (generally about 2 weeks).
- To the extent possible, carcass removal trials should be conducted at turbines that are not part of the carcass search sub-sample.

Based on the findings of the carcass removal trials, a scavenger correction factor will be calculated using the following formula:

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

S_c is the proportion of carcasses not removed by scavengers of the search period
 n_{visit0} is the total number of carcasses placed
 $n_{\text{visit1}} \dots$ are the numbers of carcasses remaining on each visit

7.1.4 Searcher Efficiency Trials

All observers will overlook some carcasses. This percentage will vary depending on the observer, the habitat and the area being searched, among other factors. Searcher efficiency trials will be undertaken in order to correct for carcasses that may be overlooked by surveyors during the survey periods.

Searcher efficiency trials will be conducted in accordance with the following principles:

- Trials will typically be conducted once in each of spring, summer and fall, but will be repeated if searchers change during the year.
- Trials involve a “tester” that places bird and bat carcasses under turbines prior to the standard carcass searches to test the searcher’s detection rate. The searcher will not be aware of the timing of the test.
- Trial carcasses will be discreetly marked so they can be identified as study carcasses.
- Each trial will consist of a minimum of 10 carcasses per searcher per season. As with scavenger trials, a combination of bird and bat carcasses will be used. Other small mammals may be used if bird and bat carcasses are not available.
- Trial carcasses will be placed for one search period only and will subsequently be removed if not found by the searcher.

Searcher efficiency (S_e) is 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 so it will be necessary to calculate a weighted average that reflects the proportion of turbines each searcher searched. The weighted average or overall searcher efficiency will be calculated as follows:

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

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S_{eo} is the overall searcher efficiency
 S_{e1} and S_{e2} and S_{e3} ... are the individual searcher efficiency ratings
 n_1 and n_2 and n_3 ... are the number of turbines searched by each searcher
 T is the total number of turbines searched by all searchers

7.2 Birds

7.2.1 Carcass Searches, Searcher Efficiency and Carcass Removal Trials

Bird mortality monitoring will be undertaken in conjunction with bat monitoring and will follow the same general timing and sampling protocol. However, in addition to the surveys conducted from May 1 to October 31, additional surveys focused on raptor mortality will be conducted, as follows:

- once a month from May 1 to October 31, all turbines in the project will be surveyed for evidence of raptor mortality; and,
- once per week from November 1 to November 30, the selected sub-sample of turbines will be searched for additional evidence of raptor mortality.

Searcher efficiency and scavenger removal trials will not be conducted during the November 1 to November 30 extended monitoring period. The results of monthly surveys at all turbines will not be used in the sample survey mortality estimate calculations, but will be tallied separately to identify individual or groups of turbines that may exceed the raptor mortality thresholds. Similarly, the separate calculation for raptor mortality will use the searcher efficiency and carcass removal results relevant to raptors only.

Tissue samples from 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 will be contacted prior to disposing bird carcasses, to determine if this type of research is occurring in the area.

8.0 Post-Construction Mitigation and Contingency Plans

Post-construction mitigation will be implemented in the event that performance objectives (mortality thresholds) are exceeded. Operational mitigation will be implemented as a first step. If this mitigation is found to be insufficient to bring the project back into compliance with mortality thresholds, then additional contingency plans will be enacted. Each is described below.

8.1 Bats

For bats, operational mitigation has been pre-determined by the MNR and involves the following:

- Wind turbine cut-in speed will be changed to 5.5m/s (measured at hub height) or feathering of wind turbine blades when wind speeds are below 5.5 m/s.
- This change will be effective from July 15 to September 30 each year for the duration of the project.
- If the above mitigation is require then an additional 3 years of effectiveness monitoring will be commenced, beginning from the time turbine operations were altered.

If significant bat mortality continues to be experienced subsequent to the implementation of operational mitigation, contingency measures will be enacted. Contingency plans will be flexible to allow for an appropriate response to the problem identified. Any actions will be discussed in detail with the MNR prior to initiation. Contingency plans may include:

- increased monitoring and reporting frequency to further narrow the scope, extent and cause of threshold exceedances;
- behavioural studies to determine factors affecting mortality rates;
- shifts in the timing of changes to blade cut-in speed and/or blade feathering if migration timing appears to be different than the set July 15 to September 30 schedule;
- consideration of new technologies which may reduce fatalities; or,
- others identified based on the specific problem experienced.

8.2 Birds

If mortality thresholds are exceeded, the following measures will be undertaken:

- For exceedances of the annual mortality thresholds:

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- Two years of scoped mortality and cause and effects monitoring will be undertaken. This may be followed by operational mitigation (e.g., blade feathering or turbines shut-down during specified periods) if significant annual mortality persists.
- For exceedances of the single significant bird mortality event:
 - Immediate action will be undertaken, including any of the options listed above.

The best available science and information will be considered when determining appropriate mitigation. All proposed responses to high mortality will be discussed in detail with the MNR. Actions may include:

- comparing declines to population trends noted through province or continent-wide breeding bird and amphibian monitoring surveys;
- developing paired-point count studies in habitats outside of the turbine area to confirm that the decline is due to turbine disturbance and not other natural factors, and determine extent of disturbance effect;
- investigation of habitat management techniques to increase breeding density;
- 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); or,
- the use of emerging and new technologies that may reduce bird fatalities.

9.0 EEMP Summary

The EEMP is summarized in **Table 9.1**

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Table 9.1 Environmental Effects Monitoring Plan for Birds, Bats and Natural Heritage Features

Natural Heritage Feature	Potential Negative Effect	Performance Objective	Mitigation Strategy	Post-Construction Monitoring Plan	Operational Mitigation	Contingency Plan
Bats	<ul style="list-style-type: none"> Direct mortality associated with collisions with project components during operation. 	<ul style="list-style-type: none"> Mortality threshold of 10 bats/turbine/year (averaged across the site), monitoring year is from May 1 to October 31. 	<ul style="list-style-type: none"> Locate turbines in agricultural fields and layout associated infrastructure to avoid the need to remove any forest habitat. 	<ul style="list-style-type: none"> Monitoring for first 3 years of operation. Monitoring should begin on May 1 when project is fully operational. If full commissioning is delayed, post-construction monitoring of partially completed project should not be delayed for more than 1 year. Carcass sampling twice-weekly (3 to 4 day intervals) at a subsample (at least 30% of turbines in representative areas throughout the project location), search area of 50 m radius, search time of approximately 20 minutes per turbine or at all turbines within 120 m of Bat Maternal Colonies identified as significant through pre-construction habitat use surveys in representative areas (Visibility Classes 1 and 2). <ul style="list-style-type: none"> monitoring of bat carcass removal rate by scavengers (or other means); and monitoring of searcher efficiency (i.e., number of bat fatalities present that are actually detected by surveyors). Post-Construction Monitoring Reports should be submitted to the MOE for each monitoring year as part of the EEMP. 	<p>For exceedances of the annual mortality thresholds:</p> <ul style="list-style-type: none"> Wind turbine cut-in speed at relevant turbines will be changed to 5.5 m/s (measured at hub height) or feathering of wind turbine blades when wind speeds are below 5.5 m/s. This change will be effective from July 15 to September 30 each year for the duration of the project. An additional 3 years of effectiveness monitoring will be commenced, beginning from the time turbine operations were altered, if alteration is required. 	<ul style="list-style-type: none"> Increased monitoring and reporting frequency to further narrow the scope, extent and cause of threshold exceedances. Behavioural studies to determine factors affecting mortality rates. Shifts in the timing of changes to blade cut-in speed and/or blade feathering if migration timing appears to be different than the set July 15 to September 30 schedule. Consideration of new technologies which may reduce fatalities. Others identified based on the specific problem experienced.
Birds	<ul style="list-style-type: none"> Direct mortality associated with collisions with project components during operation. 	<p>Mortality thresholds of:</p> <ul style="list-style-type: none"> 14 birds/ turbine/ year at individual turbines or turbine groups; 0.2 raptors/ turbine/ 	<ul style="list-style-type: none"> Locate turbines in agricultural fields and layout associated infrastructure to avoid the need to remove any forest or grassland habitat. 	<ul style="list-style-type: none"> Monitoring for first 3 years of operation. Monitoring should begin on May 1 when project is fully operational. If full commissioning is delayed, post-construction monitoring of partially completed project should not be delayed for more than 1 year. 	<p>For exceedances of the annual mortality thresholds:</p> <ul style="list-style-type: none"> Two years of scoped mortality and cause and effects monitoring will be undertaken. This may be followed by operational mitigation 	<ul style="list-style-type: none"> Comparing declines to population trends noted through province or continent-wide breeding bird and amphibian monitoring surveys. Developing paired-point count studies in habitats outside of the

Natural Heritage Feature	Potential Negative Effect	Performance Objective	Mitigation Strategy	Post-Construction Monitoring Plan	Operational Mitigation	Contingency Plan
		<p>year (all raptors) across a wind power project;</p> <ul style="list-style-type: none"> 0.1 raptors/ turbine/ year (provincially tracked raptors) across a wind power project; or, 2 raptors/wind power project (<10 turbines). <p>Or, any single mortality event in excess of:</p> <ul style="list-style-type: none"> 10 or more birds at any one turbine; or, 33 or more birds (including raptors) at multiple turbines. <p>A monitoring year is from May 1 to October 31 and Continues until November 30 for raptor monitoring.</p>		<ul style="list-style-type: none"> Carcass sampling twice-weekly (3 to 4 day intervals) at a subsample (at least 30%) of turbines in representative areas (Visibility Classes 1 and 2). Search area of 50 m radius, search time of approximately 20 minutes per turbine. Additional raptor mortality surveys: <ul style="list-style-type: none"> Once a month from May 1 to October 31, all turbines in the project will be surveys for evidence of raptor mortality; and, Once per week from November 1 to November 30, the selected sub-sample of turbines will be searched for additional evidence of raptor mortality. Monitoring of bird carcass removal rate by scavengers (or other means). Monitoring of searcher efficiency (i.e., number of bird fatalities present that are actually detected by surveyors). Where significant annual bird mortality is identified, subsequent scoped mortality and cause and effects monitoring should be conducted for 2 years at individual turbines (and unmonitored turbines in near proximity). When mitigation has been implemented, effectiveness monitoring at individual turbines should be conducted on an additional 3 years. Post-Construction Monitoring Reports should be submitted to the MOE for each monitoring year as part of the EEMP. 	<p>(e.g. blade feathering or turbine shut-down during specified periods) if significant annual mortality persists.</p> <p>For exceedances of the single significant bird mortality event:</p> <ul style="list-style-type: none"> Immediate action will be undertaken regardless of the location of the turbine in relation to bird significant wildlife habitat (e.g. blade feathering, turbine shut-down during specified periods or other contingency measures noted to the right 	<p>turbine area to confirm that the decline is due to turbine disturbance and not other natural factors, and determine extent of disturbance effect.</p> <ul style="list-style-type: none"> Investigation of habitat management techniques to increase breeding density; 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). The use of emerging and new technologies that may reduce bird fatalities.

10.0 Reporting and Review of Findings

Annual post-construction monitoring reports will be prepared to summarize the results of all bird, and bat surveys. Reports will be submitted to the MNR and MOE within three months of the conclusion of the November mortality monitoring period.

As part of the adaptive management approach, the monitoring program will be reassessed by the MNR and the Grand Bend Wind Limited Partnership at the end of each monitoring year. Subject to the reassessment, the survey methodologies, frequencies and duration may be reasonably modified to better reflect findings.

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11.0 Permitting

Several permits will be required in order to conduct post-construction monitoring. Permit applications will be submitted at least six months in advance of the anticipated monitoring start date to ensure that all permits are in place prior to commencement.

The following permits will be required:

- Scientific Collector's Permit under the *Fish and Wildlife Conservation Act* from the MNR;
- Scientific Collector's Permit under the *Migratory Bird Convention Act* from Environment Canada (Canadian Wildlife Service); and,
- A permit under clause 17(2)b of the *Endangered Species Act* from the MNR.

These permits will allow for the handling, collection and storage of birds, bats and any species at risk found during surveys. Additional monitoring and handling measures may be identified for species at risk and will be identified in the applicable *Endangered Species Act* permit.

12.0 Confirmation from Ministry of Natural Resources

Under Section 28 of O.Reg. 359/09, the Ministry of Natural Resources (“MNR”) must review the EEMP and confirm that it was completed in accordance with criteria and procedures accepted by that Ministry. This EEMP is currently under review and is awaiting confirmation. A copy of the MNR confirmation will be provided in **Appendix B** upon receipt.

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13.0 Conclusions

The Grand Bend Wind Farm has been sited to avoid significant wildlife habitat as much as possible. No significant habitats related to birds were identified within 120 m of the Project Location. Ten candidate Bat Maternal Colonies were identified which are being treated as significant and which will be subject to habitat use studies prior to construction.

Mitigation measures are proposed within the Environmental Impact Study (Neegan Burnside, August 2012), which will minimize impacts on birds and bats. Post-construction monitoring is proposed to ensure that mitigation measures are sufficient and that performance objectives are being met.

The monitoring program described in this report meets the requirements for monitoring under O.Reg. 359/09 and under MNR bird and bat guidance documents. The program is designed to be flexible and allow for adaptive changes, if necessary.

With this Environmental Effects and Monitoring Plan, any negative impacts on birds and bats can be identified and appropriately addressed.

Environmental Effects Monitoring Plan: Birds and Bats
August 2012

Written by:

Signature _____ Date August 2012
Tricia Radburn, M.Sc. (PI), MCIP, RPP
Environmental Planner
R.J. Burnside & Associates Limited

Reviewed by:

Signature _____ Date August 2012
Lyle Parsons, P.Eng
Project Manager
R.J. Burnside & Associates Limited

Approved by:

Signature _____ Date August 2012
Jim Mulvale, P.Eng
Manager, Environment, Health And Safety
Northland Power Inc.

14.0 References

Ministry of Natural Resources. 2011b. Bats and Bat Habitats, Guidelines for Wind Power Projects. First Edition. Queen's Printer for Ontario.

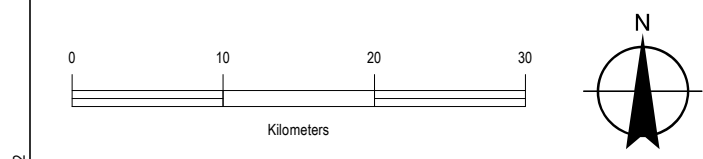
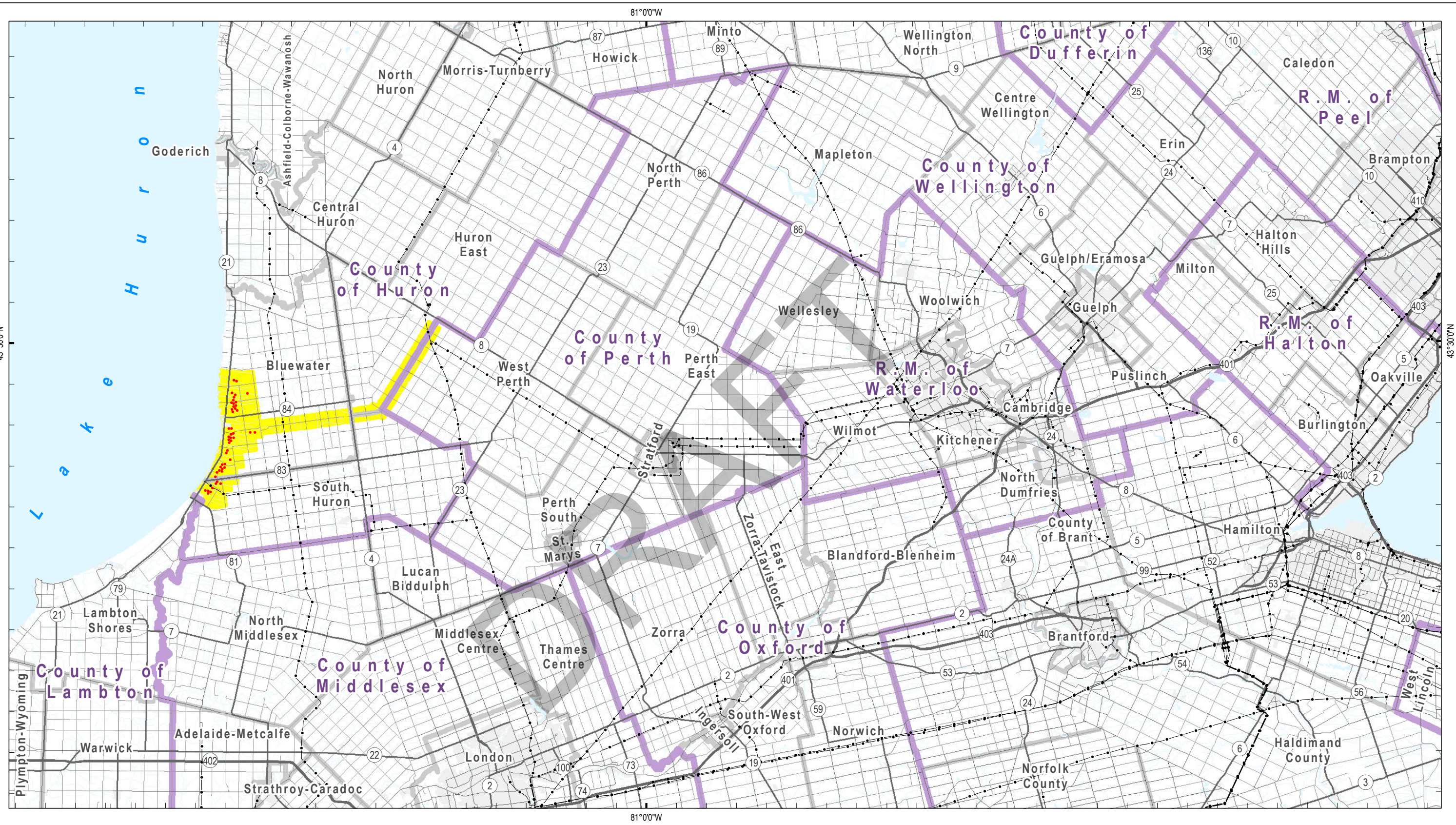
Ministry of Natural Resources. 2011b. Birds and Bird Habitats, Guidelines for Wind Power Projects. First Edition. Queen's Printer for Ontario.

Ministry of Natural Resources. 2006. Wind Turbines and Bats: Bat Ecology Background Information and Literature Review of Impacts. Queen's Printer for Ontario.

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Appendix A
Figures

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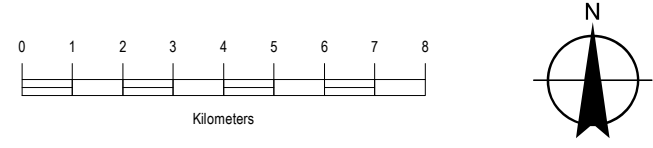
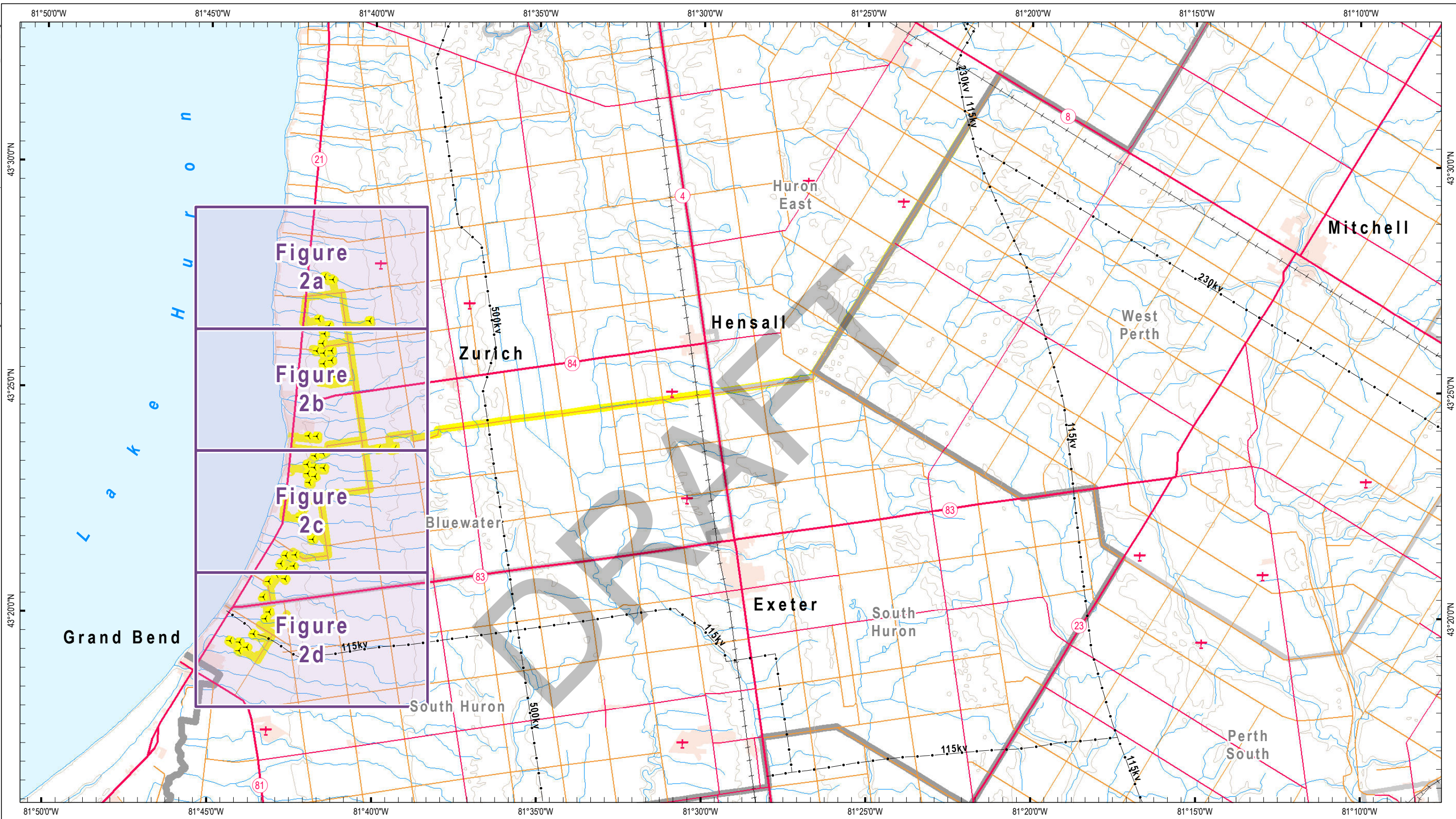




- Wind Turbine Location
- Project Area



Title
Grand Bend Wind Farm
Grand Bend Wind Limited Partnership
Site Investigation Results
Project Area

Prepared	P. Stubbert	Checked	T. Radburn	Map Number	1
Scale	1:150,000	Project	PIA019991		

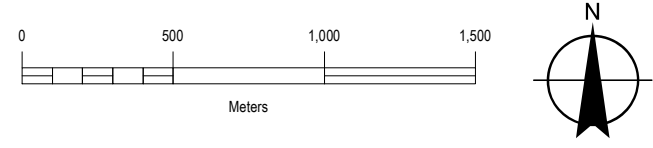















-  Wind Turbine Location
-  120m From Project Location



Title			
Grand Bend Wind Farm Grand Bend Wind Limited Partnership Environmental Effects Monitoring Plan Bird & Bat Monitoring Stations			
Prepared	P. Stubbert	Checked	T. Radburn
Scale	1:150,000	Project	PIA019991
Figure Number			2 - Key Map

Note: All infrastructure shown on the map represents proposed locations

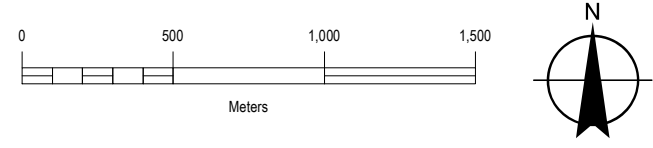


-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line: Overhead
-  Collector Line; Transmission Line: Underground
-  Bird & Bat Monitoring Station
-  Access Road & Underground Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
-  Transformer Sub-Station
-  Bat Maternal Colony (Treated as Significant)
-  Ecoregion 6E - 7E Division



Title			
Grand Bend Wind Farm Grand Bend Wind Limited Partnership Environmental Effects Monitoring Plan Bird & Bat Monitoring Stations			
Prepared	P. Stubbert	Checked	T. Radburn
Scale	1:25,000	Project	PIA019991
Figure Number			2a

Note: All infrastructure shown on the map represents proposed locations



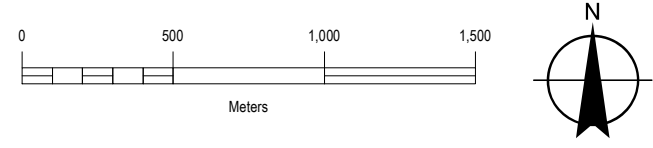
Wind Turbine Location	Bird & Bat Monitoring Station	Transformer Sub-Station
120m From Project Location	Access Road & Underground Collector Line	Bat Maternal Colony (Treated as Significant)
Study Area	Access Road	Ecoregion 6E - 7E Division
Transmission Line: Overhead	Access Road: For Construction (Temporary)	
Collector Line; Transmission Line: Underground	Assembly Site Area Boundary	
















Title
Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Environmental Effects Monitoring Plan
 Bird & Bat Monitoring Stations

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number	2b
Scale	1:25,000	Project	PIA019991		

Note: All infrastructure shown on the map represents proposed locations



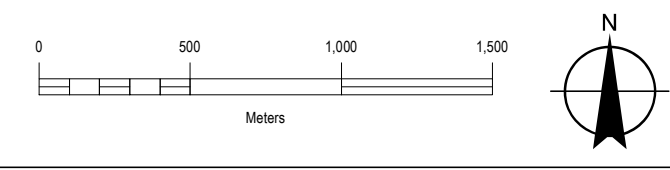
-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line: Overhead
-  Collector Line; Transmission Line: Underground
-  Bird & Bat Monitoring Station
-  Access Road & Underground Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
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Title
Grand Bend Wind Farm
Grand Bend Wind Limited Partnership
Environmental Effects Monitoring Plan
Bird & Bat Monitoring Stations

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number
Scale	1:25,000	Project	PIA019991	2c

Note: All infrastructure shown on the map represents proposed locations



-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line: Overhead
-  Collector Line; Transmission Line: Underground
-  Bird & Bat Monitoring Station
-  Access Road & Underground Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
-  Transformer Sub-Station
-  Bat Maternal Colony (Treated as Significant)
-  Ecoregion 6E - 7E Division



Title
Grand Bend Wind Farm
Grand Bend Wind Limited Partnership
Environmental Effects Monitoring Plan
Bird & Bat Monitoring Stations

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number
Scale	1:25,000	Project	PIA019991	2d

Note: All infrastructure shown on the map represents proposed locations

Appendix B
MNR Confirmation

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