



Grand Bend Wind Farm
Natural Heritage Environmental Effects
Monitoring Plan

Grand Bend Wind Limited Partnership
Northland Power Inc., as agent



NEEGAN BURNSIDE

February 2013



Grand Bend Wind Farm Natural Heritage Environmental Effects Monitoring Plan

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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
1	November 30, 2012	Revised Submission to MNR
2	January 23, 2013	Revised Submission to MNR
2	February 15, 2013	Application for Renewable Energy Approval

Executive Summary

The Grand Bend Wind Limited Partnership, with Northland Power Inc. (“Northland”) as agent, are 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, a parts and storage (office/maintenance) building, a new transmission line within municipal road right-of ways (“ROWS”) along Sararas Road, Rodgerville Road, 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.

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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 Section 23.1 of O.Reg. 359/09 and under applicable MNR bird and bat guidance documents. The program is designed to be flexible and allow for adaptive changes, if necessary.

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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 Maternity 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

1.0 Introduction

The Grand Bend Wind Limited Partnership with Northland Power Inc. (“Northland”) as agent, are 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, a parts and storage (office/maintenance) building, a new transmission line within municipal road right-of-ways (“ROWs”) along Sararas Road, Rodgerville Road, 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.

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 negative environmental effects.
- Mitigation measures to assist in achieving the performance objectives.
- A program for monitoring negative environmental effects for the duration of the time that the project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.

Furthermore, 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).

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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.

This post-construction monitoring plan is one component of the EEMP submitted to the Ministry of the Environment as part of the REA Application for the Project. This report is intended to meet the requirements of Section 23.1 of O.Reg. 359/09 as well as EEMP requirements for other significant natural features.

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, 2013). 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 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:

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“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.

2.0 Post-Construction Monitoring for Significant Natural Features

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 which will require post-construction monitoring, as summarized in **Table 2.1** and shown on **Figure 2, Appendix A**.

Table 2.1 Significant Features Subject to Post-Construction Monitoring

Feature Type	# of Features	Feature Identifiers
Turtle Nesting Areas	1	TNA-002
Amphibian Breeding Habitat (Woodland)	1	ABH-001
Bat Maternity Colonies*	12	BMC-001, BMC-002, BMC-003, BMC-004, BMC-005, BMC-006, BMC-007, BMC-008, BMC-009, BMC-010, BMC-011, BMC-012
Turtle Wintering Areas*	1	TWA-003

*pre-construction survey required to verify significance of this feature. If not significant, EEMP measures will not apply.

A detailed description of potential impacts, mitigation, performance objectives, monitoring plans and contingency measures for each of these features is provided in the Environmental Impact Study (“EIS”). A summary is also presented in **Table 2.2** of this report and in the Design and Operations Report (Neegan Burnside, 2013).

Where mitigation measures are found to be ineffective, the contingency measures identified in **Table 2.2** will be implemented. If contingency measures need to be implemented, MNR will be notified immediately and, if required, MNR will be consulted to determine appropriate contingency measures.

The Ministry of the Environment (“MOE”) will be provided with a report that summarizes the results of the EEMP for all aspects of the project. The MNR will be provided with an annual report that summarizes the results of the monitoring described in this report.

Table 2.2 Environmental Effects Monitoring Plan for Significant Natural Features

Feature(s)	Distance to project locations (components)	Potential Negative Environmental Effects	Mitigation Strategy	Performance Objective	Environmental Effects Monitoring Plan					Contingency Measure
					Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
BMC-001* BMC-002* BMC-003* BMC-004* BMC-005* BMC-005* BMC-006* BMC-007* BMC-008* BMC-009* BMC-010* BMC-011* BMC-012*	2 m to 119 m	Habitat displacement or avoidance Note: Post-construction mortality of bats and detailed monitoring plan is addressed in the Environmental Effects Monitoring Plan as part of the Design and Operations Report.	Infrastructure sited outside of the significant wildlife habitat feature	Continued use of the habitat by the species (Little brown bat, Eastern Small-footed bat, Northern Long-eared bat or Tricolored Bat, Silver-haired Bat) that currently inhabits the feature. White nose syndrome may have an impact on the abundance of bats, specifically Northern long-eared and Little Brown bats.	Apply same methodology followed during pre-construction monitoring (exit count surveys coupled with acoustic monitoring using broadband bat detector to identify species) See Appendix B for detailed survey methods	At snags/tree cavities to be identified and monitored during pre-construction surveys.	Pre-construction Survey (baseline): June 2013 Post-construction Survey: <ul style="list-style-type: none">June 2015June 2016June 2017	Determine if there is a displacement or avoidance effect caused by turbines located in proximity to bat maternity colonies	Annual Reports submitted to MNR. Estimated Report Submission Dates: <ul style="list-style-type: none">Summer 2013 (preconstruction data)Summer 2015 (yr 1 post-construction)Summer 2016 (yr 2 post-construction)Summer 2017 (yr 3 post-construction)	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.
ABH-001	33 m to 103 m	Habitat displacement or avoidance.	Strategy to site turbines outside of habitat.	Minimize impacts to amphibian breeding. Baseline amphibian calling index to be maintained at 3 for both spring peeper and grey tree frog.	Conduct an Amphibian Monitoring Program for two years following construction of the wind farm. Amphibian surveys to be undertaken in accordance with Marsh Monitoring Program Manual (Bird Studies Canada, 1994). See Appendix E for detailed survey methods.	At survey station monitored during EOS surveys in ABH-001. See Figure E in Appendix E.	Surveys will be conducted between one-half hour after sunset and midnight during each of the following three periods in 2015 and 2016: <ul style="list-style-type: none">April 15-30;May 15-30; and,June 15-30.	Determine if there is a displacement or avoidance effect caused by turbines located in proximity to amphibian breeding habitat.	Annual Reports submitted to MNR. Estimated Report Submission Dates: Summer 2015 (yr 1 post-construction) Summer 2016 (yr 2 post-construction)	Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required. Contingency measures may include additional monitoring to determine cause of decline, possible turbine shut-down or blade feathering during breeding season. Additional two years of monitoring if significant effects are observed.
TNA-002 TWA-003*	2 m to 113 m	Collisions between turtles and maintenance vehicles.	Vehicle drivers will be given training and awareness	Minimize vehicle/turtle collisions.	Drivers will record any turtle or other wildlife collisions in log	Records will be kept of any collision on any roadway in the vicinity of the Project	Records of collisions will be kept only if collisions occur.	Determine if there is significant mortality related to turtle/vehicle collisions during first two	Annual summary of logs submitted to MNR. Estimated Report	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether

Feature(s)	Distance to project locations (components)	Potential Negative Environmental Effects	Mitigation Strategy	Performance Objective	Environmental Effects Monitoring Plan					Contingency Measure
					Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
			related to this location and will be told to monitor speeds and driving conditions in this area. Drivers will be given a log book with which to enter information about any collisions with turtles or other wildlife. Signage will be erected to notify drivers of turtle crossing area.		book. Conduct turtle nesting and overwintering monitoring for two years following construction of the wind farm. See Appendix C for detailed survey methods.	Location. Signage will be posted in close proximity to TNA-003 and TWA-002 on Turnbull's Road. Two-year monitoring at TNA-002 and TWA-003* survey stations. See Figure E in Appendix C.	Two years of habitat monitoring will be conducted on three separate occasions in late March, mid-April and early-May on days without rain or fog.	years of operations. Determine if there is any change in the use of the habitat.	Submission Dates: <ul style="list-style-type: none">• Summer 2015 (yr 1 post-construction)• Summer 2016 (yr 2 post-construction)	contingency measures are required and the contingency measures to be undertaken.

*pre-construction survey required to verify significance of this feature. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented

3.0 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).

3.1 Mortality Thresholds

A threshold approach will be used to identify and mitigate significant bat and bird mortality resulting from the operation of wind turbines.

3.1.1 Bats

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

- 10 bats / turbine / year.

This threshold has been determined based on bat mortality reported at wind power projects in Ontario and comparison with jurisdictions across North America.

3.1.2 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 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.

3.2 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 knowledge 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 to October 31, and continues until November 30 specifically for raptor monitoring. Should additional bat or bird 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 to 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/bird SWH);
- 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/bats, an additional 3 years of effectiveness monitoring where mitigation is applied.

All searchers will have updated rabies pre-exposure vaccinations.

3.2.1 Effort and Timing for Bird and Bat Mortality Monitoring

Minimum requirements for post-construction monitoring of bats include:

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- 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 coordination of bird mortality monitoring (May 1 to October 31) for the first 3 years of wind turbine operation.
- 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.
- Bat and bird mortality surveys will occur at all turbines at wind power projects ≤10 turbines. For wind power projects >10 turbines, a sub-sample of at least 30% of turbines (minimum 10 turbines) will be selected to cover representative areas throughout the project location.
- For birds, all turbines within the project location will be monitored once a month during the May 1 to October 31 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).
- Should significant bat or bird 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.

A total of 15 turbines have been selected to cover representative areas throughout the project location. The draft sub-sample was 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 the closest turbine to each candidate Bat Maternity Colony habitat.

Currently, 12 Bat Maternity Colony habitats are being treated as significant (Refer to the Environmental Impact Study, Neegan Burnside, 2013 for details). Turbines closest to these habitats 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 substituted for another turbine to achieve a more representative sample as long as the total number of turbines being monitored does not decrease below 15.

Table 3.1 and **Figure 3, Appendix A** show the location of turbines to be included in post-construction monitoring.

Table 3.1 Turbines to be Included in Post-Construction Surveys

Turbine	Associated Candidate Bat Maternity Colony Habitat
T-02	BMC-012
T-04	N/A
T-07	N/A
T-17	BMC-010
T-18	BMC-011
T-22	BMC-009
T-25	BMC-009; BMC-008
T-27	BMC-008
T-31	BMC-007
T-33	BMC-006
T-38	BMC-005
T-40	BMC-004
T-42	BMC-002; BMC-003
T-44	N/A
T-48	BMC-001

*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.

Post-construction monitoring will begin May 1 of the year that the wind power project is fully operational. The commercial operation date of the Grand Bend Wind Farm is fall, 2014; therefore, it is anticipated that post-construction monitoring will begin May 1, 2015.

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.

3.2.2 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).

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- 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 **Table 3.2**. 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.

Table 3.2 Visibility Classes

%Vegetation Cover	Vegetation Height	Visibility Class
≥90% bare ground	≤15cm tall	Class 1 (Easy)
≥25% bare ground	≤15cm tall	Class 2 (Moderate)
≤25% bare ground	≤25% > 30cm tall	Class 3 (Difficult)
Little or no bare ground	≥25% > 30cm 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/labeled with species, sex, date, time, location (UTM coordinate), 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; and,
 - scavenged.

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- 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 Cooperative 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).
- If any injured birds or bats are found during carcass searches, they will be placed in a plastic container with breathable lid and taken to a local wildlife rehabilitator or veterinarian. A contact list of approved rehabilitator or veterinarians will be developed prior to the start of carcass searches.

3.2.3 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 will 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, summer, fall) 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.**
- Carcasses will be monitored every 3 to 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.
- Where possible, at least one raptor should be used for carcass removal trials.
- 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.

3.2.4 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, summer and fall) during the same period as the bat 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.
- 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) 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.
- All observers, even those with trained dogs, will overlook some carcasses. This percentage will vary depending on the observer, the habitat and the area being searched, etc.

3.2.5 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 50m 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. A map of the actual search area for each turbine

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searched, and a description of areas deemed to be unsearchable (e.g., vegetation height, type, slope, etc.), will be provided in the mortality report.

3.2.6 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:

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

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

$n_{\text{visit1}} - n_{\text{visit3}}$ are the numbers of carcasses on visits 1 through 3

Searcher Efficiency

Searcher efficiency (S_e) 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 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:

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

Where,

S_{e0} is the overall searcher efficiency

S_{e1} and S_{e2} and S_{e3} are individual searcher efficiency ratings

N_1 and N_2 and N_3 are number of turbines searched by each searcher

T is the total number of turbines searched by all searchers

Proportion Area Searched

Proportion area searched (P_s) is calculated as follows:

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

Where $r = 50\text{m}$

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_{e0} is the weighted proportion of carcasses expected to be found by searchers (overall searcher efficiency)

S_c is the proportion of carcasses not removed by scavengers over the search period

P_s is the proportion of the area searched

3.2.7 Other Considerations

- The above calculations will be presented in corrected number 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 or bird mortality be found based on supplemental monitoring (e.g., associated with SWH) 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 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.

3.3 Post-Construction Mitigation**3.3.1 Bats**

Post-construction mitigation will be required where post-construction monitoring identifies disturbance effects associated with bat SWH. 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 consists of 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 the annual bat mortality threshold of 10 bats/turbine/year has been exceeded, operational monitoring 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 10 weeks. Any shift in the operational mitigation period to match peak mortality should be determined in coordination with and confirmed by MNR.

Where post-construction monitoring 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.

3.3.2 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 SWH, or significant bird mortality events.

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

For turbines located within 120 m of bird SWH, 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 SWH.

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 will be considered that may reduce bird fatalities.

3.4 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.

3.4.1 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.

3.4.2 Birds

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.

3.4.3 Species at Risk

The Species at Risk in Ontario List (O.Reg. 230/08) will be consulted to determine species listed as endangered and threatened in Ontario. Mortality or injury of an endangered or threatened species will be reported to Ministry of Natural Resources within 24 hours of detection or next business day.

3.5 Reporting Requirements

Data collected during post-construction monitoring will be submitted in accordance with MNR data standards and templates. Post-construction reports will be prepared and submitted as per **Table 3.3**.

Table 3.3 Schedule for Post-construction Monitoring Reports Detailing Results of the Environmental Effects Monitoring Plan

Monitoring Year*	Report Submission Date
Year 1: May 1 – Nov 30, 2015	February 2016
Year 2: May 1 – Nov 30, 2016	February 2017
Year 3: May 1 – Nov 30, 2017	February 2018

If additional years of monitoring are required the additional report submissions will follow a similar schedule as listed above.

All bat and bird 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 (see **Appendix B** for data template). Bat survey data submitted 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 found at http://www.bsc-eoc.org/birdmon/wind/wind_templates.jsp 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.

A summary of when information about a particular mortality event or threshold is reported to Ministry of Natural Resources is included in **Table 3.4**.

Table 3.4 Timeline for reporting mortality to Ministry of Natural Resources

Mortality Threshold	How mortality is calculated	Reporting Timeline for Results
10 bats / turbine / year	Based on calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 3.3.
14 birds / turbine / year	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 3.3.

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Mortality Threshold	How mortality is calculated	Reporting Timeline for Results
10 birds / turbine	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
33 birds (including raptors) at any multiple turbines	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
0.2 raptors / turbine / year (all raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
0.1 raptors / turbine / year (provincially tracked raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
Endangered and Threatened Species	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection.

4.0 EEMP Summary

The EEMP is summarized in **Table 4.1**

Table 4.1 Environmental Effects Monitoring Plan for Birds, Bats and Natural Heritage Features

Natural Heritage Feature	Potential Negative Effect	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Operational Mitigation	Contingency Plan
				Methodology	Monitoring Locations	Frequency and Duration of Monitoring	Technical and Statistical Value of Data	Reporting Requirements		
Bats	<ul style="list-style-type: none"> Direct mortality associated with collisions with project components and/or barotrauma 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. 	<ul style="list-style-type: none"> As shown on Figure 3, Appendix A. 	<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 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 Maternity 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). 	<ul style="list-style-type: none"> Determine if there is significant mortality as a result of turbine operations. 	<ul style="list-style-type: none"> Post-Construction Monitoring Reports should be submitted to the MOE for each monitoring year as part of the EEMP. Reports to be submitted: <ul style="list-style-type: none"> Feb 2016; Feb 2017; Feb 2018; or As described in Table 3.4. 	<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"> To be determined in consultation with the MNR. May include: <ul style="list-style-type: none"> 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/ year (all raptors) across a wind power project; 	<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 	<ul style="list-style-type: none"> As shown on Figure 3, Appendix A. 	<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 	<ul style="list-style-type: none"> Determine if there is significant mortality as a result of turbine operations. 	<ul style="list-style-type: none"> Post-Construction Monitoring Reports should be submitted to the MOE for each monitoring year as part of the EEMP. Reports to be submitted: <ul style="list-style-type: none"> Feb 2016; Feb 2017; Feb 2018; or As described in Table 3.4. 	<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"> MNR will be consulted to determine appropriate contingency plans should a significant bird mortality event occur or if mitigation actions fail. The use of emerging and

Natural Heritage Feature	Potential Negative Effect	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Operational Mitigation	Contingency Plan
				Methodology	Monitoring Locations	Frequency and Duration of Monitoring	Technical and Statistical Value of Data	Reporting Requirements		
		<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>		completed project should not be delayed for more than 1 year.		<p>turbines in the project will be surveys for evidence of raptor mortality; and,</p> <ul style="list-style-type: none"> 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. 			<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 	new technologies may be considered to reduce bird fatalities.

5.0 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 or Certificate of Reporting 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.

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6.0 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. Twelve candidate Bat Maternity 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, January 2013), 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 Section 23.1 of 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.

Respectfully submitted,

Neegan Burnside Ltd.

Written by:


Signature  Date February 2013
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Signature  Date February 2013
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Environmental Effects Monitoring Plan: Birds and Bats
February 2013

Approved by:

Signature  _____ Date February 2013
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Manager, Environment, Health And Safety
Northland Power Inc.

Environmental Effects Monitoring Plan: Birds and Bats
February 2013

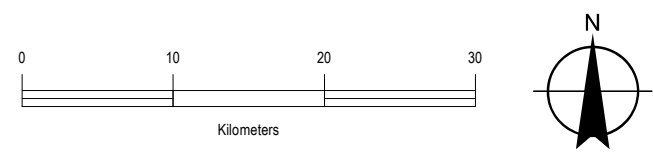
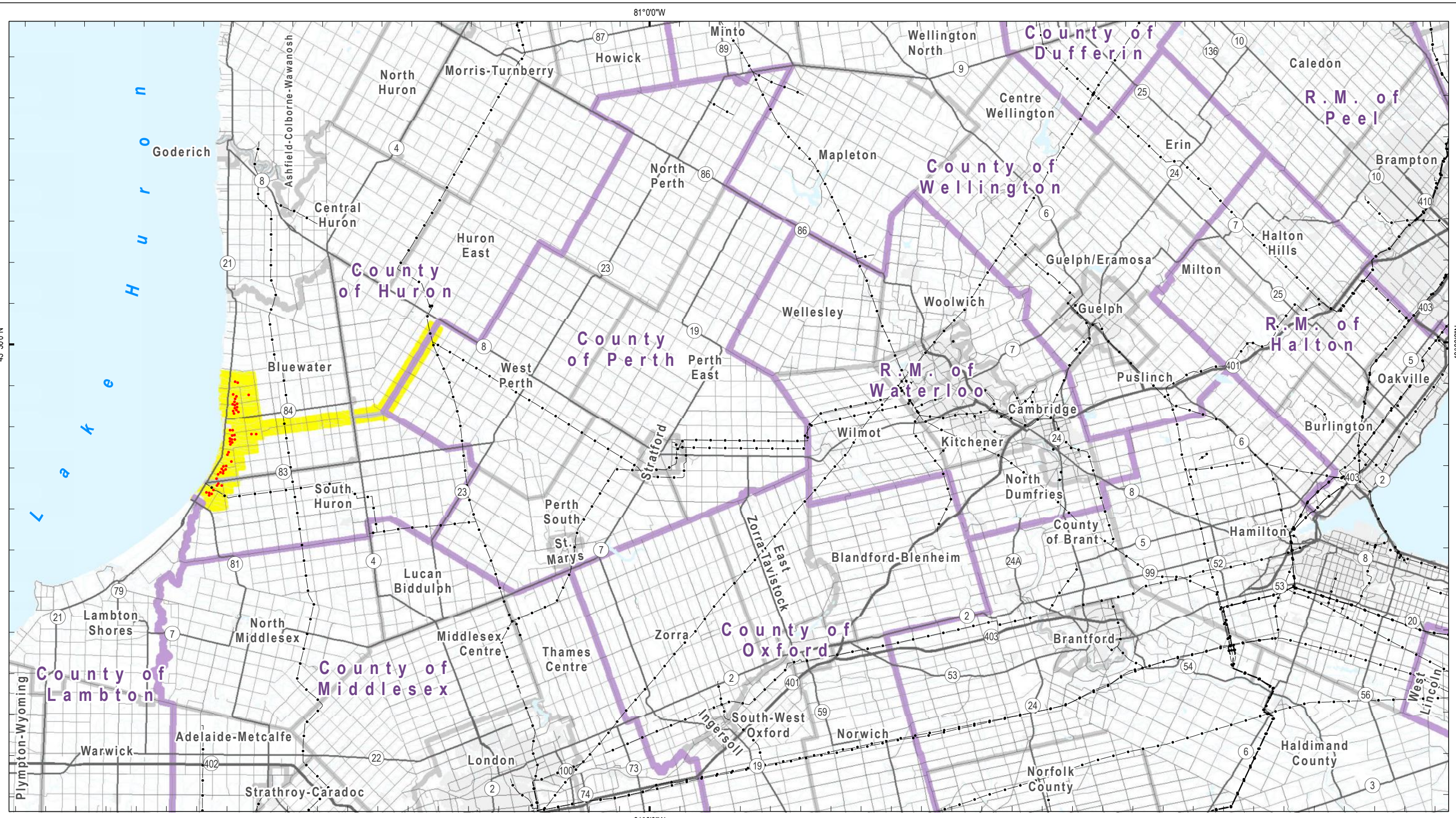
7.0 References

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.

Appendix A
Figures

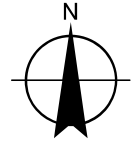
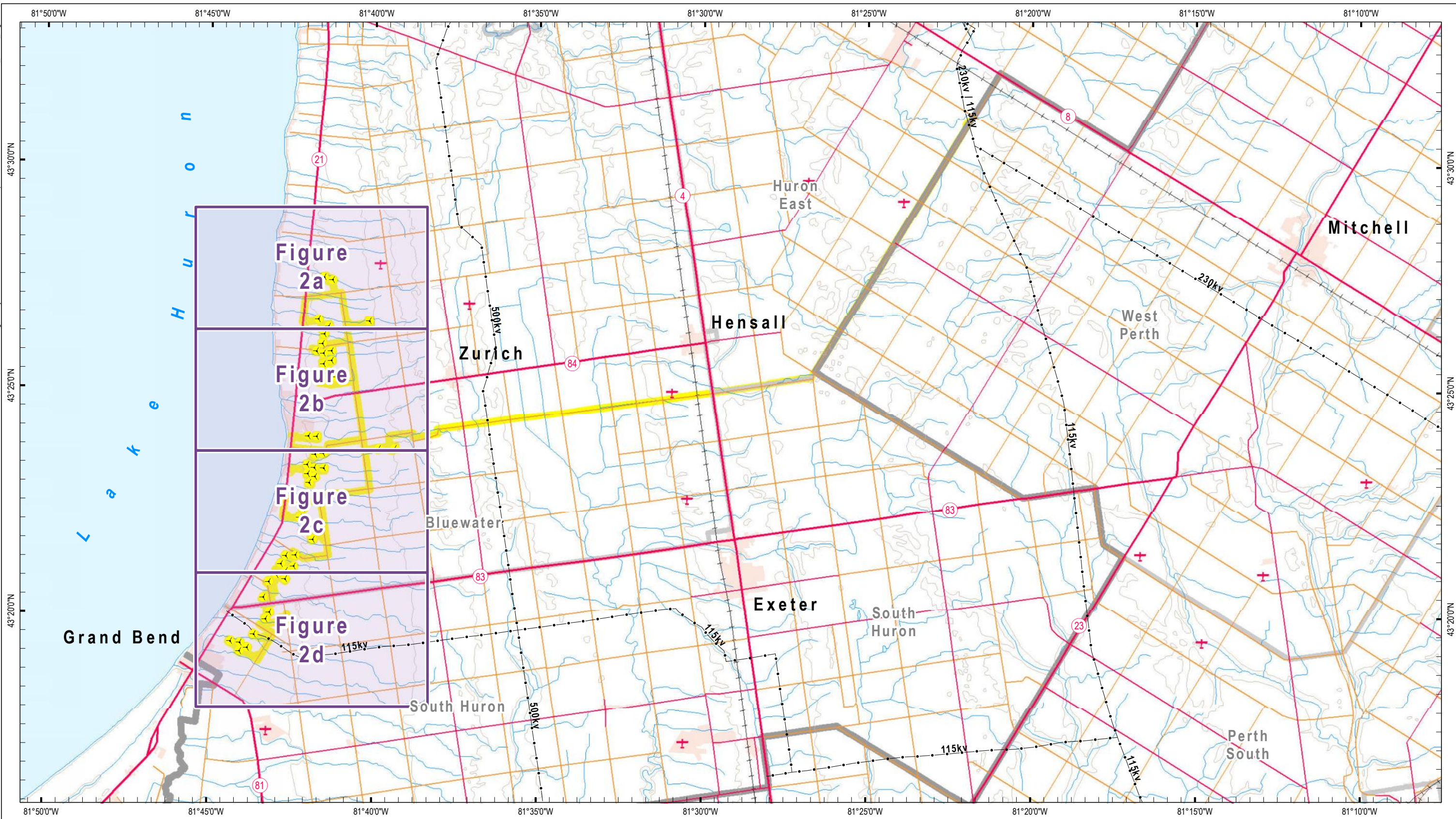




- Wind Turbine Location
- Project Area



Title
Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Environmental Effects Monitoring Plan
 Project Area

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



-  Wind Turbine Location
-  120m From Project Location

NEEGAN BURNSIDE

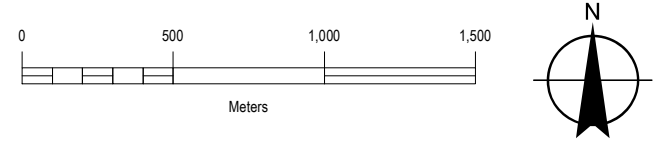
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Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Significant Natural Features Subject
 to Post-Construction Monitoring

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number
Scale	1:150,000	Project	PIA019991	2 - Key Map

Note: All infrastructure shown on the map represents proposed locations



SWH Code	Description
ABH	Amphibian Breeding Habitat (Woodland)
BMC	Bat Maternal Colony
CNB	Colonial Nesting Birds
CN	Common Night Hawk
DYA	Deer Yarding Area
MBBH	Marsh Bird Breeding Habitat
RH	Reptile Hibernacula
SCC	Species of Conservation Concern
TNA	Turtle Nesting Area
TWA	Turtle Wintering Area



- Wind Turbine Location
- 120m From Project Location
- Study Area
- Transmission Line
- Collector Line
- Transformer Sub-Station, Switching Yard
- Access Road & Collector Line
- Access Road
- Access Road: For Construction (Temporary)
- Area of Construction Disturbance
- Area Subject to Post-Construction Monitoring
- Ecoregion 6E - 7E Division



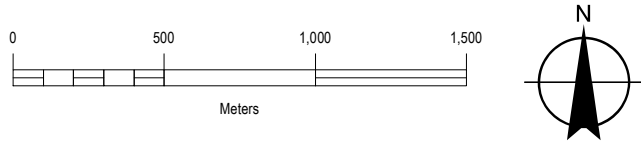
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Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Significant Natural Features Subject
 to Post-Construction Monitoring

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

Note: All infrastructure shown on the map represents proposed locations



SWH Code	Description
ABH	Amphibian Breeding Habitat (Woodland)
BMC	Bat Maternal Colony
CNB	Colonial Nesting Birds
CN	Common Night Hawk
DYA	Deer Yarding Area
MBBH	Marsh Bird Breeding Habitat
RH	Reptile Hibernacula
SCC	Species of Conservation Concern
TNA	Turtle Nesting Area
TWA	Turtle Wintering Area



- Wind Turbine Location
- 120m From Project Location
- Study Area
- Transmission Line
- Collector Line
- Transformer Sub-Station, Switching Yard
- Access Road & Collector Line
- Access Road
- Access Road: For Construction (Temporary)
- Area of Construction Disturbance
- Area Subject to Post-Construction Monitoring
- Ecoregion 6E - 7E Division



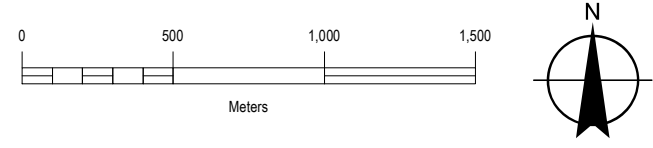
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Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Significant Natural Features Subject
 to Post-Construction Monitoring

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



SWH Code	Description
ABH	Amphibian Breeding Habitat (Woodland)
BMC	Bat Maternal Colony
CNB	Colonial Nesting Birds
CN	Common Night Hawk
DYA	Deer Yarding Area
MBBH	Marsh Bird Breeding Habitat
RH	Reptile Hibernacula
SCC	Species of Conservation Concern
TNA	Turtle Nesting Area
TWA	Turtle Wintering Area



- Wind Turbine Location
- 120m From Project Location
- Study Area
- Transmission Line
- Collector Line
- Transformer Sub-Station, Switching Yard
- Access Road & Collector Line
- Access Road
- Access Road: For Construction (Temporary)
- Area of Construction Disturbance
- Area Subject to Post-Construction Monitoring
- Ecoregion 6E - 7E Division



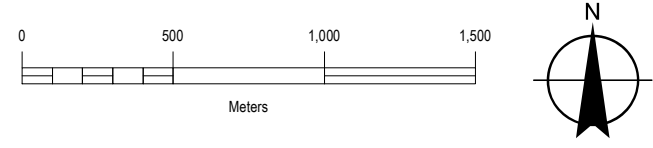
Title
**Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Significant Natural Features Subject
 to Post-Construction Monitoring**

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



SWH Code	Description
ABH	Amphibian Breeding Habitat (Woodland)
BMC	Bat Maternal Colony
CNB	Colonial Nesting Birds
CN	Common Night Hawk
DYA	Deer Yarding Area
MBBH	Marsh Bird Breeding Habitat
RH	Reptile Hibernacula
SCC	Species of Conservation Concern
TNA	Turtle Nesting Area
TWA	Turtle Wintering Area



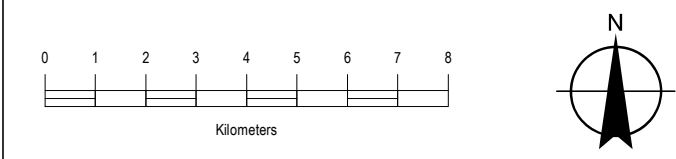
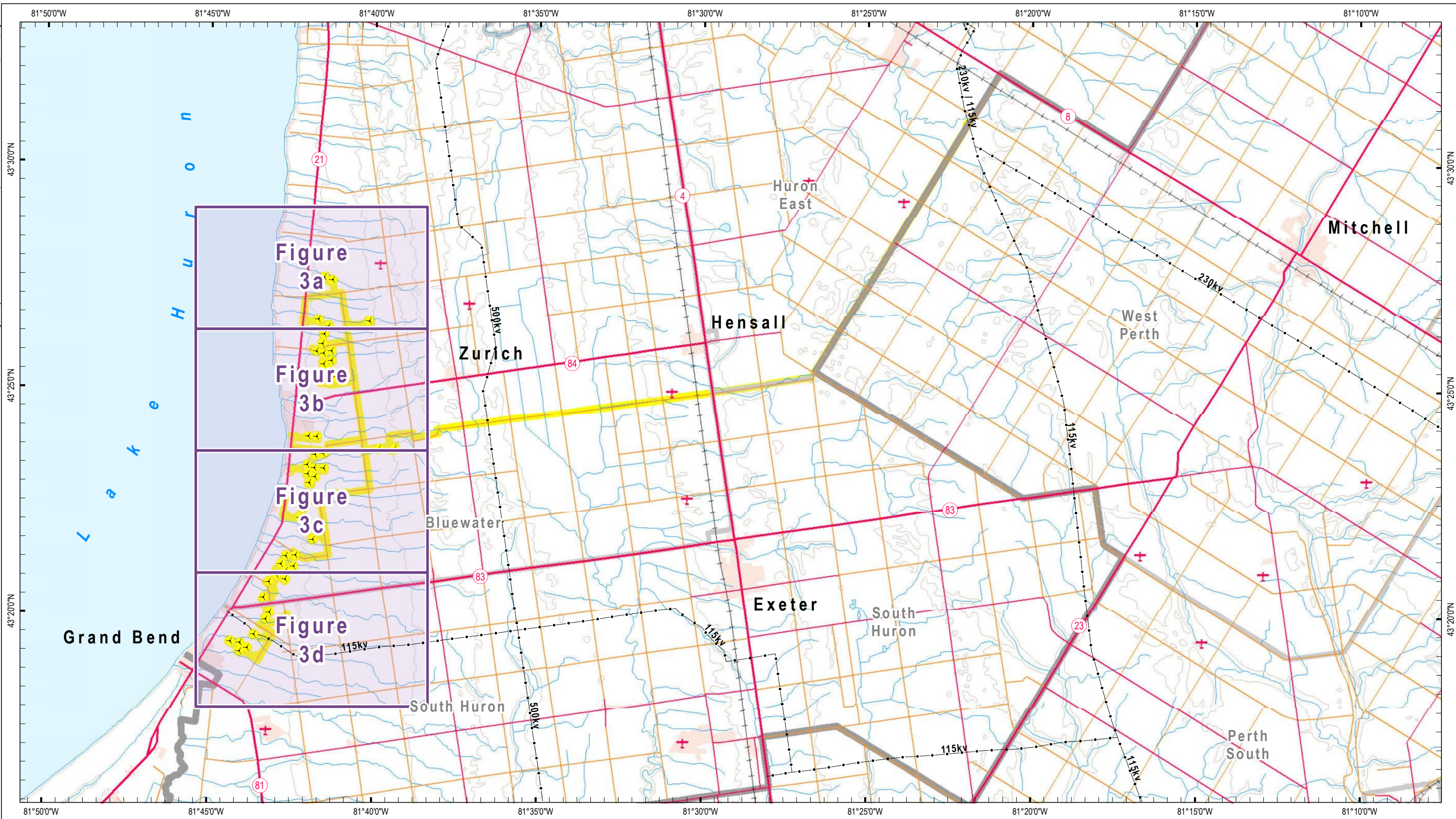
- Wind Turbine Location
- 120m From Project Location
- Study Area
- Transmission Line
- Collector Line
- Transformer Sub-Station, Switching Yard
- Access Road & Collector Line
- Access Road
- Access Road: For Construction (Temporary)
- Area of Construction Disturbance
- Area Subject to Post-Construction Monitoring
- Ecoregion 6E - 7E Division





Title
Grand Bend Wind Farm
Grand Bend Wind Limited Partnership
Significant Natural Features Subject
to Post-Construction Monitoring

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



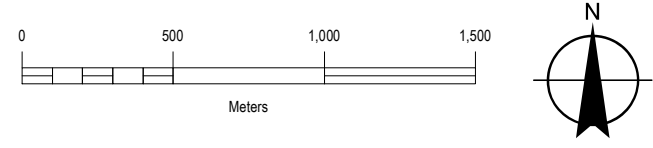
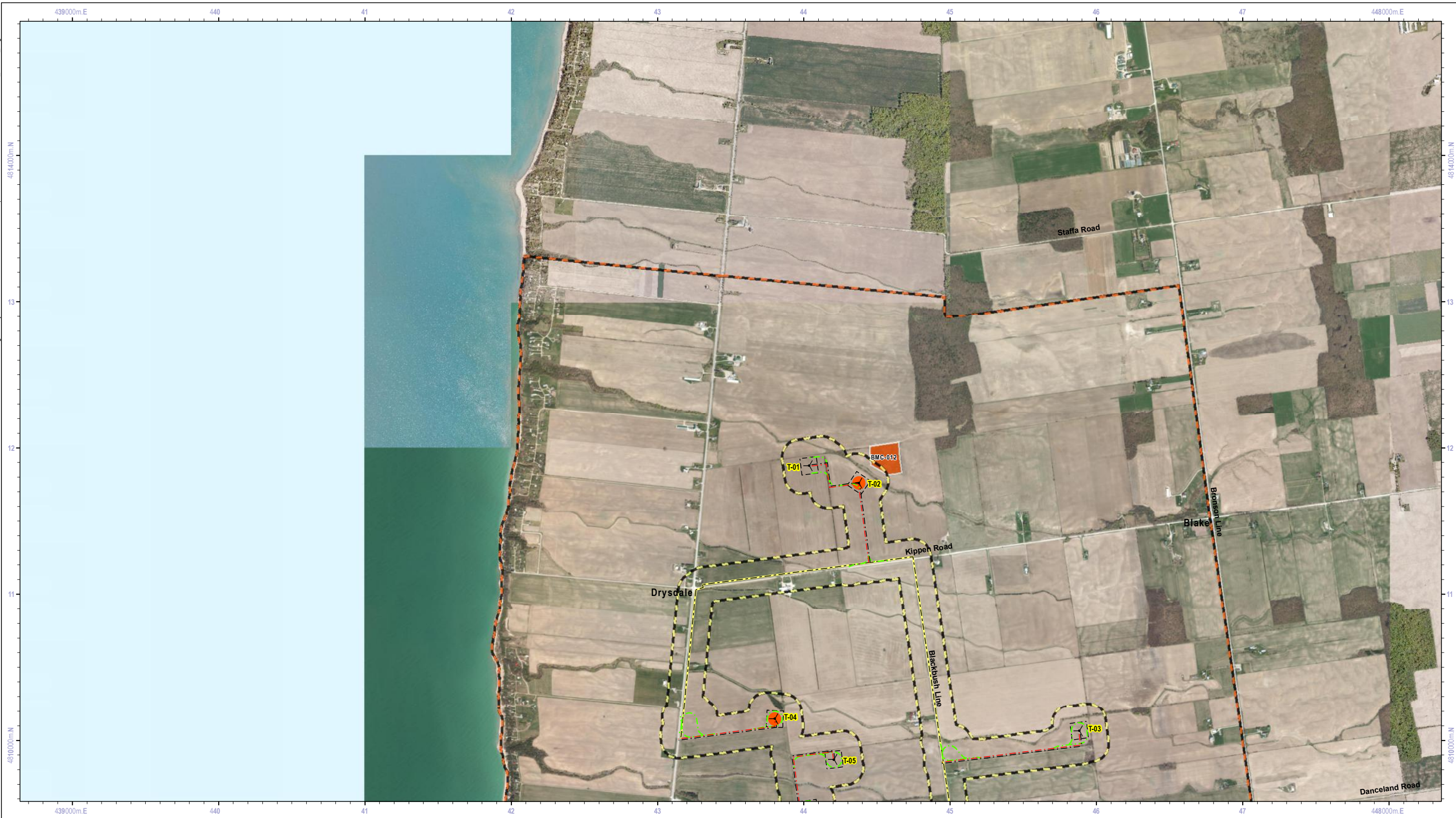
-  Wind Turbine Location
-  120m From Project Location


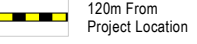
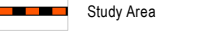
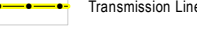
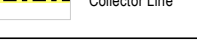

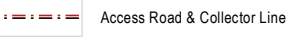

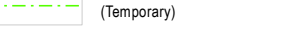
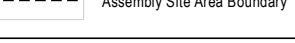

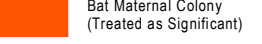
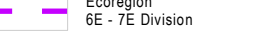


Title
**Grand Bend Wind Farm
 Grand Bend Wind Limited Partnership
 Environmental Effects Monitoring Plan
 Bird & Bat Monitoring Stations**

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number
Scale	1:150,000	Project	PIA019991	3 - Key Map

Note: All infrastructure shown on the map represents proposed locations



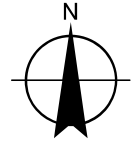
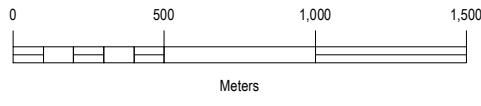
-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line
-  Collector Line
-  Bird & Bat Monitoring Station
-  Access Road & Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
-  Transformer Sub-Station
-  Bat Maternal 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	3a

Note: All infrastructure shown on the map represents proposed locations



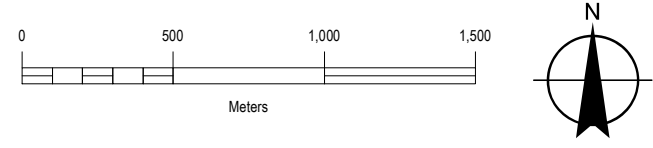
-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line
-  Collector Line
-  Bird & Bat Monitoring Station
-  Access Road & Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
-  Transformer Sub-Station
-  Bat Maternal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


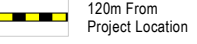
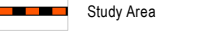
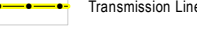
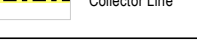

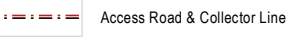
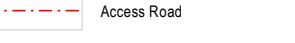
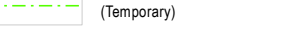
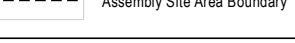

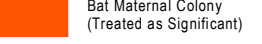
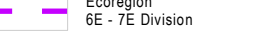


**Grand Bend Wind Farm
Grand Bend Wind Limited Partnership
Environmental Effects Monitoring Plan
Bird & Bat Monitoring Stations**

Prepared	P. Stubbert	Checked	T. Radburn	Figure Number
Scale	1:25,000	Project	PIA019991	3b

Note: All infrastructure shown on the map represents proposed locations



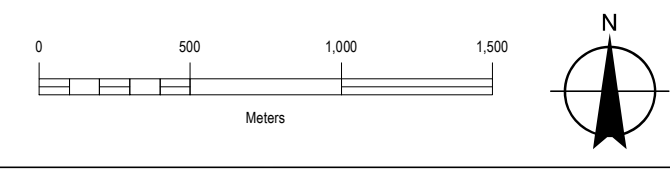
-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line
-  Collector Line
-  Bird & Bat Monitoring Station
-  Access Road & Collector Line
-  Access Road
-  Access Road: For Construction (Temporary)
-  Assembly Site Area Boundary
-  Transformer Sub-Station
-  Bat Maternal 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	3c

Note: All infrastructure shown on the map represents proposed locations



-  Wind Turbine Location
-  120m From Project Location
-  Study Area
-  Transmission Line
-  Collector Line
-  Bird & Bat Monitoring Station
-  Access Road & 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	3d

Note: All infrastructure shown on the map represents proposed locations

Appendix B
Reporting Template

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 : _____ m² (e.g. 7,854 m² 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)

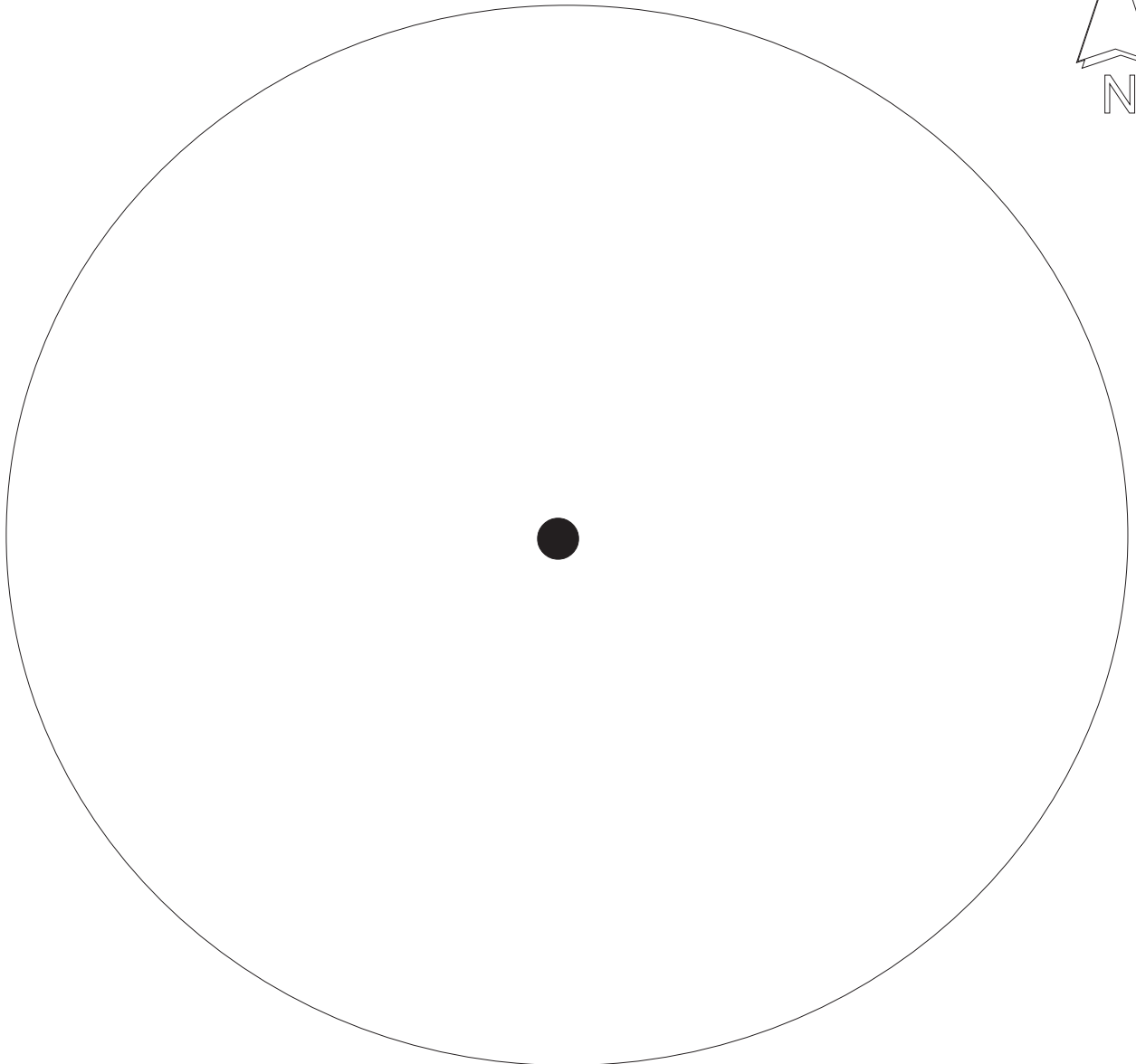
2. Site Description and Carcass Distribution Form (Carcass Searches)

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

Appendix C
MNR Confirmation Letter

January 30, 2013

Gordon Potts, P.Eng.
Grand Bend Wind Limited Partnership
c/o Northland Power Inc.
30 St. Clair Avenue West, 17th Floor
Toronto, ON, M4V 3A1

RE: Natural Heritage Section of the EEMP for Grand Bend Wind Farm

Dear Mr Potts:

MNR has reviewed the Natural Heritage section of the Environmental Effects Monitoring Plan (EEMP) for the Grand Bend Wind Farm located in Huron County, submitted January 29, 2013. The final document is titled Grand Bend Wind Farm Natural Heritage Environmental Effects Monitoring Plan and dated January 2013.

This letter confirms that the EEMP was prepared in respect of birds and bats in accordance with the Ministry of Natural Resources:

- *Birds and Bird Habitats: Guidelines for Wind Power Projects(2011)*
- *Bats and Bat Habitats: Guidelines for Wind Power Projects (2011)*

Post-construction monitoring for the Grand Bend Wind Farm will include the following:

- i. Amphibian Breeding Habitat (ABH-001)
- ii. Turtle Nesting Area (TNA-002)

If, based on results of pre-construction monitoring, wildlife habitats are found to be significant the following post-construction monitoring will be implemented:

- i. Bat Maternity Colonies (BMC-001, BMC-003, BMC-004, BMC-005, BMC-006, BMC-007, BMC-009, BMC-010, BMC-011, BMC-012)
- ii. Turtle Wintering Area (TWA-003)

MNR expects the information contained in the natural heritage section of the EEMP to be considered in MOE'S Renewable Energy Approval decision, and if approved, be implemented by the applicant.

If you wish to discuss, please contact Jim Beal at jim.beal@ontario.ca or 705-755-3203.

Sincerely,



Kazia Milian
Planning Coordinator
Southern Region MNR

cc Jim Beal, Renewable Energy Operations Team, Coordinator, MNR
Ian Hagman, District Manager, Guelph District, MNR
Narren Santos, Environmental Approvals Access & Service Integration Branch, MOE
Zeljko Romic, Environmental Approvals Access & Service Integration Branch, MOE
Tricia Radburn, Environmental Planner, Neegan Burnside Ltd.

