



*Natural Heritage Environmental Effects Monitoring Plan  
for the McLean's Mountain Wind Farm*

**Supplementary Information for the Design and Operations Report  
Under the Renewable Energy Approval (REA) Requirements, Ontario  
Regulations 359/09 for Class 4 Wind Facility**

*Final*

*Prepared by:*

**Dillon Consulting Limited**  
*September 2012*

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## 1.0 Purpose of the Environmental Effects Monitoring Plan

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

1. *Bats and Bat Habitats: Guidelines for Wind Power Projects*
2. *Birds and Bird Habitats: Guidelines for Wind Power Projects*

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 document has been prepared in accordance with O. Reg. 359/09, MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

## 2.0 Project Overview

A Feed In Tariff (FIT) contract was awarded to Northland Power Inc. (NPI) by the Ontario Power Authority (OPA) for the construction of the McLean's Mountain Wind Farm (MMWF). This project has a nameplate capacity of 60 MW and is considered a class 4 wind project under the REA regulation. The project is proposed to be developed on private land at the following location(s):

Single-tier Municipality:	Northeastern Manitoulin and the Islands (NEMI)
Geographic Township(s):	Howland and Bidwell
Lot(s) and Concession(s):	Various

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

- 24 Wind Turbines;
- Substation;
- Operations Building;
- Access Roads;
- Feeder Lines; and
- Transmission Lines

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

- Construction Staging Area

### **3.0 Post-Construction Monitoring for Significant Natural Features**

As indicated in the Environmental Impact Study (EIS), prepared in accordance with section 38(2) of the Renewable Energy Approvals Regulation (O.Reg 359/09), the following confirmed significant and provincially significant natural features will receive post-construction monitoring:

- Waterfowl Nesting Area (WNA) 1, 4 and 5;
- Raptor Winter Roosting and Feeding Area (RWRF) 3 and 4;
- Area Sensitive Species: Forest Birds (FB) 1 and 2 – Canada Warbler, Common Nighthawk; and
- Area Sensitive Species: Open Country Breeding Birds (OCBB) 3 and 4 – Short-eared Owl and Common Nighthawk

The location of each significant or provincially significant natural feature is shown in **Figures 1 - 4**. The potential negative environmental effects, performance objectives, mitigation strategy, environmental effects monitoring plan along with contingency measures are described in **Table 1**. The environmental effects monitoring plan for each feature includes the post-construction survey methods, monitoring locations, frequency and duration of sample collection, technical and statistical value of the date, and reporting requirements.

A number of significant or provincially significant features, in addition to those listed above, were identified within 120m of the MMWF project location, including:

- Wetlands 1-10;
- Alvar (ALV) 1-4;
- Woodland Amphibian Breeding Habitat (WABH) 1, 2, 5, 6, 7 and 8;
- Turtle Overwintering Areas (TOW) 1-6; and
- Species of Conservation Concern – Cooper's Milkvetch, Slender Blazing Star, Clustered Broomrape and Prairie Dropseed.

An Environmental Impact Study (EIS) (MMWF, August 2011) was conducted to assess the potential negative impacts of the project on significant natural heritage features. Operation of the MMWF is not anticipated to have a negative impact on the above listed natural features. Therefore, no post-construction monitoring of these natural features is required. Mitigation will be implemented during the construction phase of the project to protect these natural features.

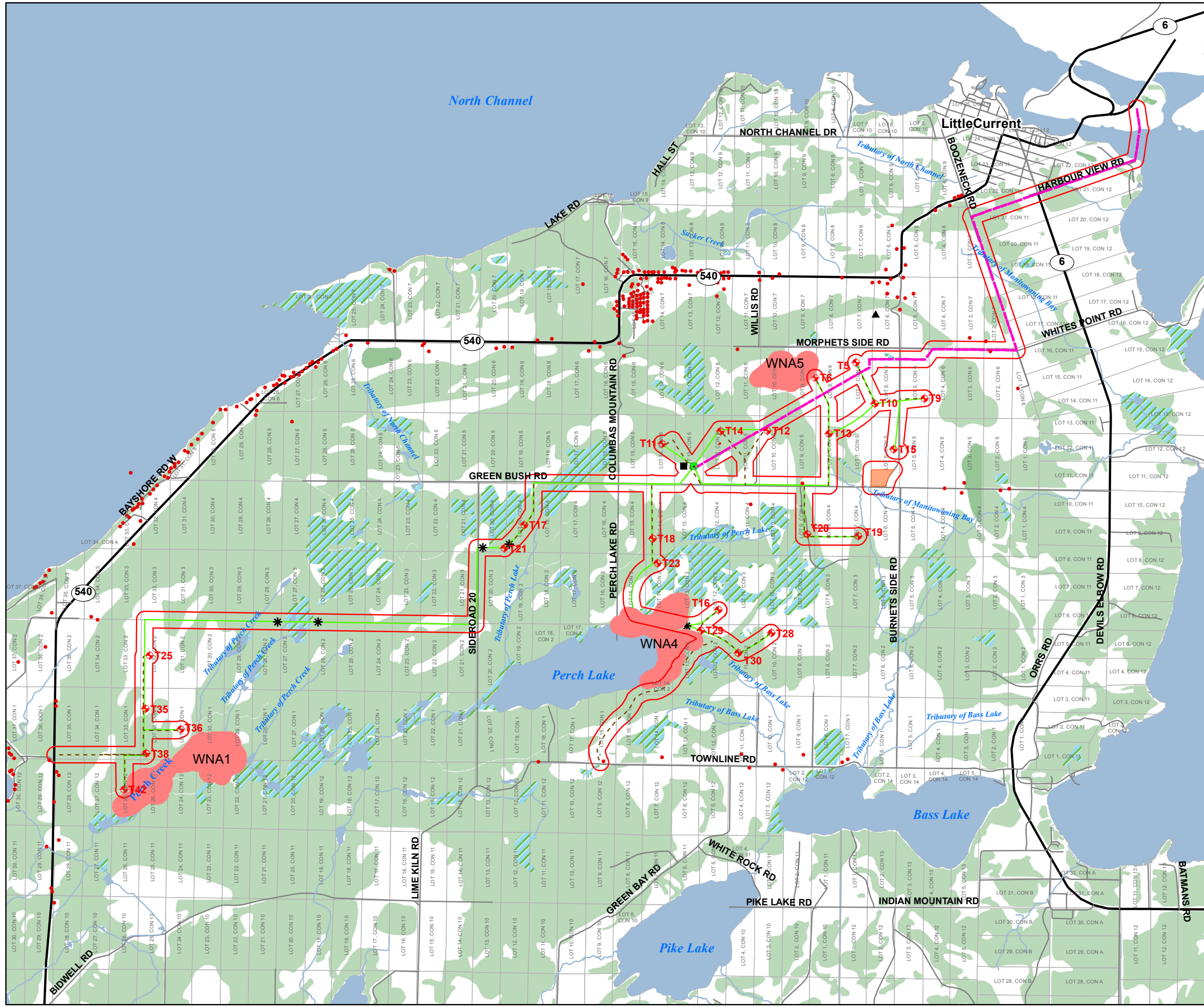
#### **3.1 Contingency Measures**

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

#### **3.2 Reporting Requirements**

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

**McLean's Mountain Wind Farm  
Figure 1: Waterfowl Nesting Areas  
to be Monitored (Post-Construction)**



**Legend**

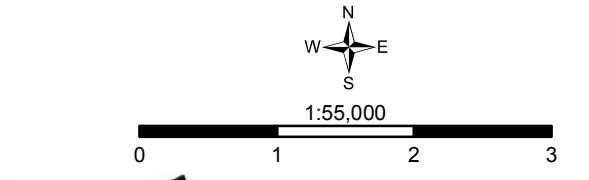
- ▲ MET Tower
- Residence
- Local Roads
- Highway
- 120 m Project Location Component Setback
- Lots/Concessions
- Water Body
- Watercourse
- Woodland
- Wetlands

**Natural Features to be Monitored (Post-Construction)**

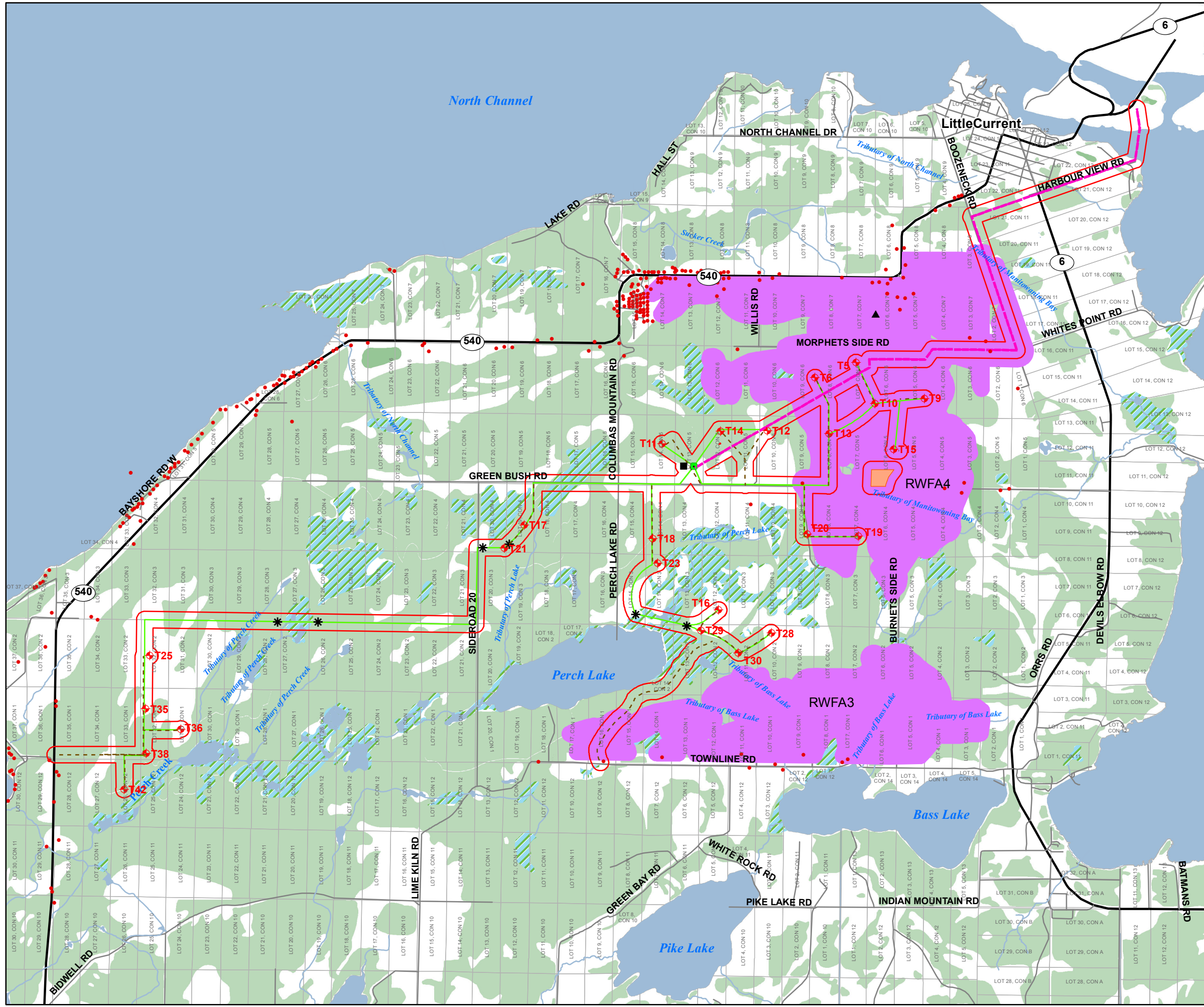
- WNA4 Waterfowl Nesting Areas

**Project Location Components**

- ◆ Wind Turbine Locations
- Substation
- Operations Building
- \* Horizontal Directional Drilling Access/Exit Pit
- - - Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area



### McLean's Mountain Wind Farm Figure 2: Raptor Winter Feeding and Roosting Areas to be Monitored (Post-Construction)



**Legend**


- ▲ MET Tower
- Residence
- Local Roads
- Highway
- 120 m Project Location Component Setback
- Lots/Concessions
- Water Body
- Watercourse
- Woodland
- Wetlands

**Natural Features to be Monitored (Post-Construction)**

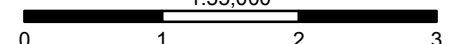
- RWFA4 Raptor Winter Feeding and Roosting Area

**Project Location Components**


- ◆ Wind Turbine Locations
- Substation
- Operations Building
- \* Horizontal Directional Drilling Access/Exit Pit
- - - Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area



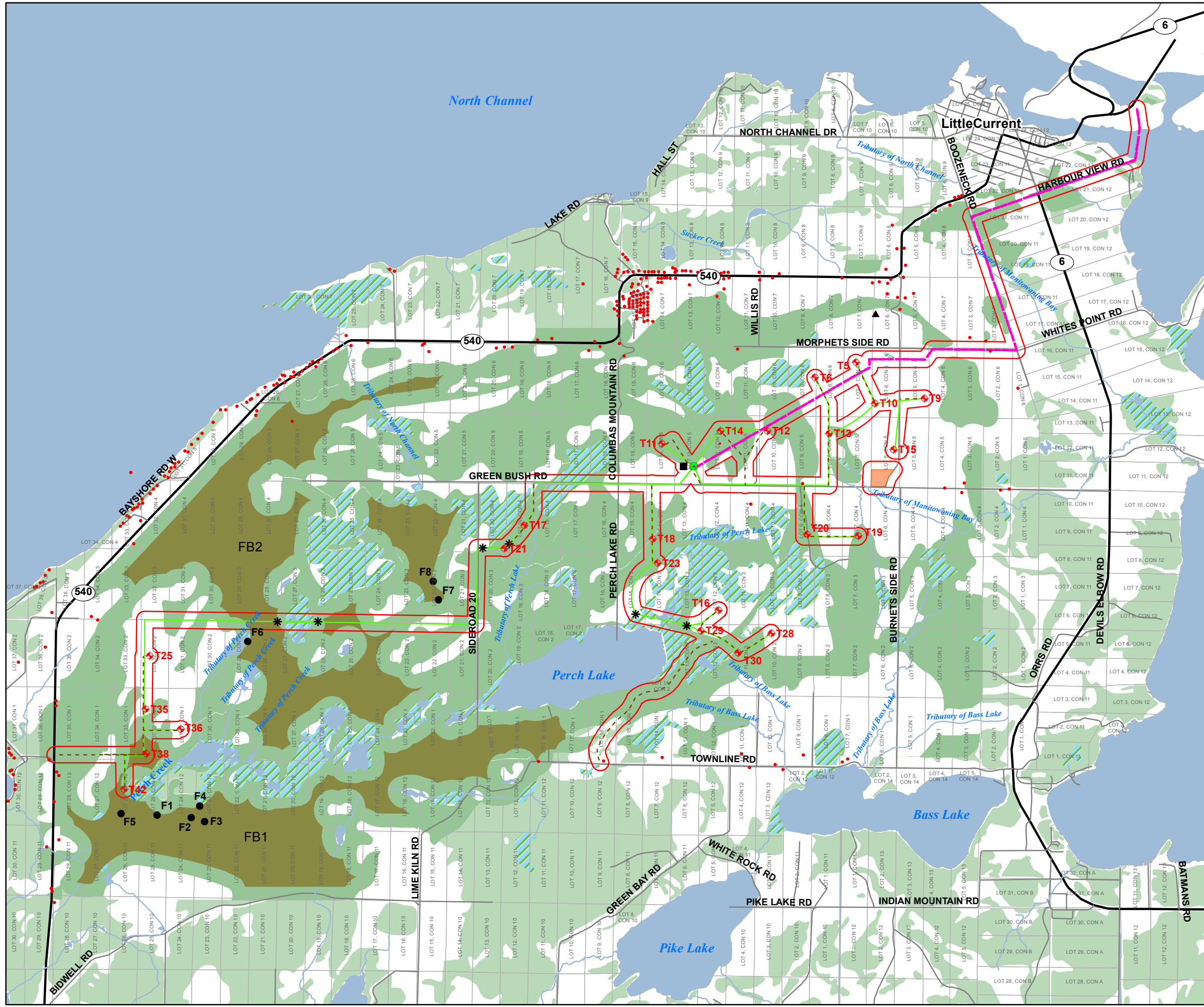
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Date Modified: September 20, 2012  
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Power2012\Mapping\EEMPA\Figure 1 Confirmed Significant and or  
Provincially Significant Natural Features that will be Monitored Post Construction.mxd



**McLean's Mountain Wind Farm  
Figure 3: Site Supporting Area-sensitive  
Species: Forest Birds to be Monitored  
(Post-Construction)**



**Legend**


- Interior Forest Point Count
- ▲ MET Tower
- Residence
- Local Roads
- Highway
- 120 m Project Location Component Setback
- Lots/Concessions
- Water Body
- Watercourse
- Woodland
- ▨ Wetlands

**Natural Features to be Monitored (Post-Construction)**

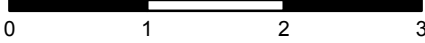
- FB1 Site Supporting Area-sensitive Species: Forest Birds

**Project Location Components**


- ◆ Wind Turbine Locations
- Substation
- Operations Building
- ★ Horizontal Directional Drilling Access/Exit Pit
- - - Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area



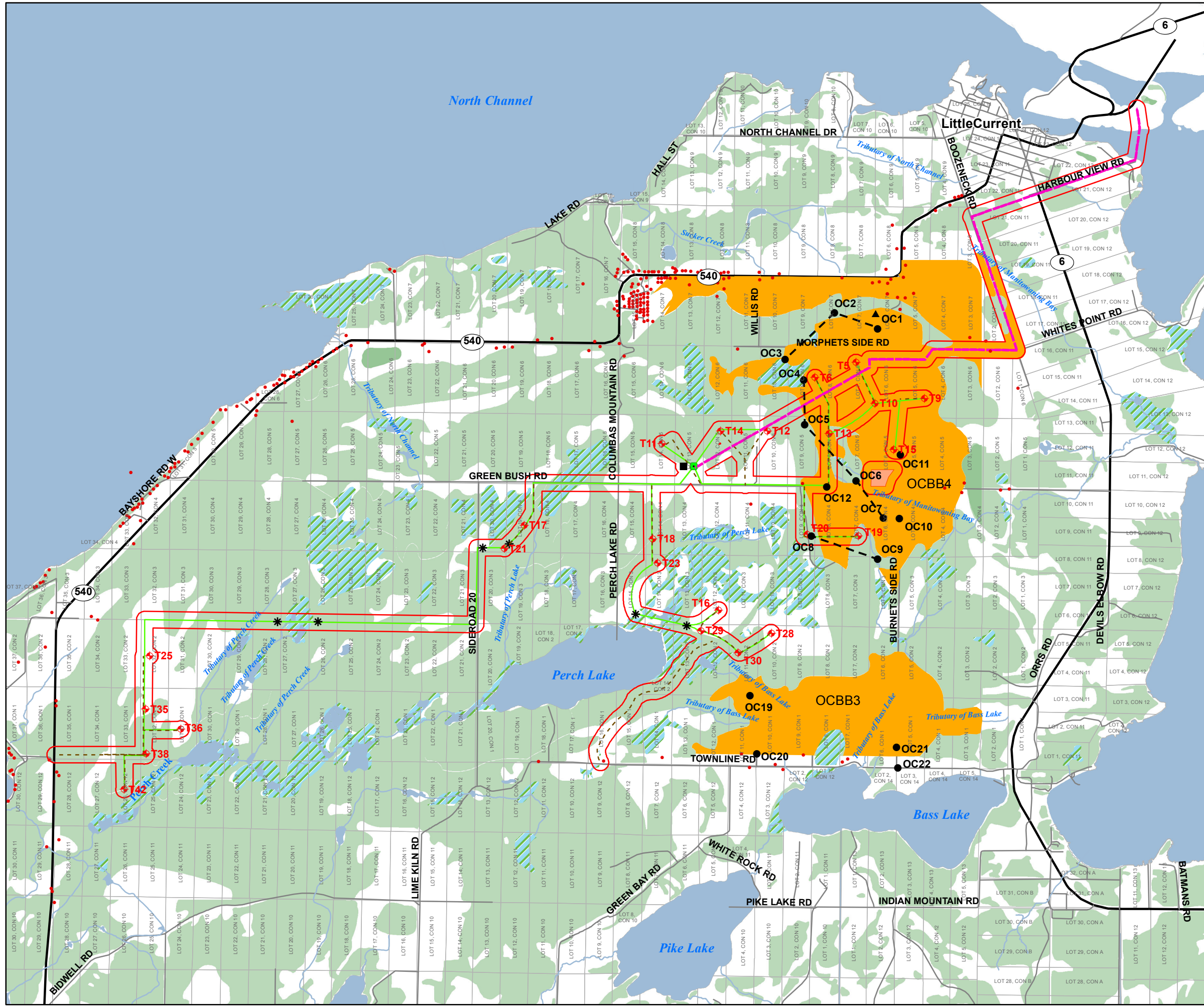
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 Power2012\Mapping\EEMPA\Figure 1 Confirmed Significant and or  
 Provincially Significant Natural Features that will be Monitored Post Construction.mxd



**McLean's Mountain Wind Farm  
Figure 4: Site Supporting Area-sensitive  
Species: Open Country Breeding Birds  
to be Monitored (Post-Construction)**



- Legend**
- Open Country Breeding Bird Habitat Point Count
  - - - Transect Route
  - ▲ MET Tower
  - Residence
  - Local Roads
  - Highway

- 120 m Project Location Component Setback
- Lots/Concessions
- Water Body
- Watercourse
- Woodland
- Wetlands

**Natural Features to be Monitored (Post-Construction)**

- OCBB4 Site Supporting Area-sensitive Species: Open Country Breeding Birds

**Project Location Components**

- ♦ Wind Turbine Locations
- Substation
- Operations Building
- \* Horizontal Directional Drilling Access/Exit Pit
- - - Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area

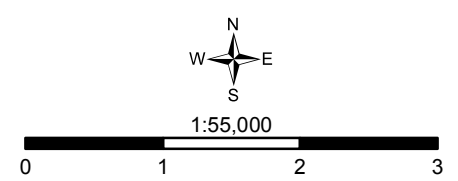




Table 1. Summary of the Environmental Effects Monitoring Plan for significant/provincially significant natural features in and within 120m of the MMWF Project where an operational impact has the potential to occur.

Unique Feature ID	Potential Negative Environmental Effects	Performance Objective	Mitigation Strategy	Environmental Effects Monitoring Plan					Contingency Measure
				Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
Waterfowl Nesting Area 1 (WNA 1)	Habitat displacement or avoidance effects due to operation of MMWF	Continued use of the habitat by waterfowl	<p>Additional pre-construction surveys will be conducted to further assess the significance of this feature. If the feature continues to be considered significant, mitigation, as detailed here, is required. Pre-construction surveys to be conducted will be confirmed in consultation with the MNR.</p> <p>Site preparation and construction will not take place during the nesting season (April 15 to June 15).</p> <p>1 year pre and 3 post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.</p>	<p>Pre and post-construction monitoring.</p> <p>See appendix A for survey methodology.</p>	Within WNA 1 (see Figure 1);	<p>Preconstruction surveys will take place spring 2013 and post construction monitoring will take place in 2014, 2015 and 2016.</p> <p>Each season the surveys will be completed at least twice; to account for early nesting and late nesting</p> <p>Therefore, the first survey will occur in mid April/early May and second survey in late May/early June.</p>	Determine if there is a displacement, or avoidance effect caused by the operation/project components located in proximity to WNA	<p>Identification of results, issues and resolutions in annual report, which is to be submitted to the MNR.</p> <p>Year 1 – report will be submitted February 2015</p> <p>Year 2 – February 2016</p> <p>Year 3 – February 2017</p>	<p>Possible change in project operations as determined necessary through consultation with MNR and Northland Power Inc.</p> <p>Possible habitat compensation in other areas of Manitoulin Island, as determined appropriate with MNR and NLP Inc.</p>
Waterfowl Nesting Area 4 (WNA 4)	Habitat displacement or avoidance effects due to operation of MMWF	Continued use of the habitat by waterfowl	<p>Additional pre-construction surveys will be conducted to further assess the significance of this feature. If the feature continues to be considered significant, mitigation, as detailed here, is required. Pre-construction surveys to be conducted will be confirmed in consultation with the MNR.</p> <p>Site preparation and construction will not take place during the nesting season (April 15 to June 15).</p> <p>1 year pre and 3 post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.</p>	<p>Pre and post construction monitoring.</p> <p>See appendix A for survey methodology.</p>	Within WNA 4 (see Figure 1)	<p>Preconstruction surveys will take place spring 2013 and post construction monitoring will take place in 2014, 2015 and 2016.</p> <p>Each season the surveys will be completed at least twice; to account for early nesting and late nesting</p> <p>Therefore, the first survey will occur in mid April/early May and second survey in late May/early June.</p>	Determine if there is a displacement, or avoidance effect caused by the operation/project components located in proximity to WNA 4.		<p>Possible change in project operations as determined necessary through consultation with MNR and Northland Power Inc.</p> <p>Possible habitat compensation in other areas of Manitoulin Island, as determined appropriate with MNR and NLP Inc.</p>

Waterfowl Nesting Area 5 (WNA 5)	Habitat displacement or avoidance effects due to operation of MMWF.	Continued use of the habitat by waterfowl	<p>Additional pre-construction surveys will be conducted to further assess the significance of this feature. If the feature continues to be considered significant, mitigation, as detailed here, is required. Pre-construction surveys to be conducted will be confirmed in consultation with the MNR.</p> <p>Site preparation and construction will not take place during the nesting season (April 15 to June 15).</p> <p>1 year pre and 3 post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.</p>	<p>Pre and post construction monitoring.</p> <p>See appendix A for survey methodology.</p>	Within WNA 5 (see Figure 1)	<p>Preconstruction surveys will take place spring 2013 and post construction monitoring will take place in 2014, 2015 and 2016.</p> <p>Each season the surveys will be completed at least twice; to account for early nesting and late nesting</p> <p>Therefore, the first survey will occur in mid April/early May and second survey in late May/early June.</p>	Determine if there is a displacement, or avoidance effect caused by operation/project components located in proximity to WNA 5.		<p>Possible change in project operations as determined necessary through consultation with MNR and Northland Power Inc.</p> <p>Possible habitat compensation in other areas of Manitoulin Island, as determined appropriate with MNR and NLP Inc.</p>
Raptor Winter Feeding and Roosting Area (RWFR 3)	Habitat displacement or avoidance effects due to operation of MMWF.	Continued use of the habitat by raptors	<p>Additional pre-construction surveys will be conducted to further assess the significance of this feature. If the feature continues to be considered significant, mitigation, as detailed here, is required. Pre-construction surveys to be conducted will be confirmed in consultation with the MNR.</p> <p>1 year pre and 3 post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.</p>		Within RWFR 3 (see Figure 2)	Preconstruction surveys will take place winter 2013 and post construction monitoring will take place in 2014, 2015 and 2016	Determine if there is a displacement, or avoidance effect caused by operation/project components located in proximity to RWFR 3.	<p>Notification of incident to the appropriate onsite personnel.</p> <p>Identification of results, issues and resolutions in annual report, which is to be submitted to the MNR.</p>	<p>Possible change in project operations as determined necessary through consultation with MNR and Northland Power Inc.</p>
Raptor Winter Feeding and Roosting Area (RWFR 4)	Habitat displacement or avoidance effects due to operation of MMWF.	Continued use of the habitat by raptors	<p>Additional pre-construction surveys will be conducted to further assess the significance of this feature. If the feature continues to be considered significant, mitigation, as detailed here, is required. Pre-construction surveys to be conducted will be confirmed in consultation with the MNR.</p> <p>1 year pre and 3 post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan..</p> <p>3 years post-construction mortality monitoring during the winter months (December through to March)</p>	<p>Pre and post construction monitoring.</p> <p>See appendix A for survey methodology.</p> <p>Winter raptor post-construction mortality monitoring will follow the October/November methodology for monitoring raptors in the Bird and Bird Habitats: Guidelines for Wind Power Projects (MNR, 2011), as well as section 4.2.1 and</p>	<p>Within RWFR 4 (see Figure 2)</p> <p>Winter raptor post-construction mortality monitoring will occur at the following turbines:</p> <p>Weekly Monitoring at: T5, T6, T9, T10, T13, T15, T19, T20.</p> <p>Monthly Monitoring at: T12, 14, 28, 29, 30</p>	Preconstruction surveys will take place winter 2013 and post construction monitoring will take place in 2014 2015 and 2016.	Determine if there is a displacement, mortality or avoidance effect caused by operation/project components located in proximity to RWFR 4.	<p>Disturbance Monitoring:</p> <p>Year 1 – report will be submitted in February 2015</p> <p>Year 2 – February 2016</p> <p>Year 3 – February 2017</p> <p>Raptor Mortality monitoring:</p> <p>Reports will be submitted for 3 years on an annual basis within 3 months of the conclusion of the March raptor mortality</p>	<p>Possible habitat compensation in other areas of Manitoulin Island, as determined appropriate with MNR and NLP Inc.</p>

				4.2.3 within this EEMP.				monitoring	
Sites Supporting Area-sensitive Species: Forest Birds (FB 1)	Habitat displacement or avoidance effects due to operation of MMWF.	Continued use of the habitat by birds	3 years post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.	Post-construction monitoring.  See appendix A for survey methodology.	Within FB 1 (see Figure 3)	Post-construction surveys will take place in spring of 2014, 2015 and 2016.  Surveys will take place at least 3 times during the breeding season (Late May – Early July) and should be sampled at least 10 days apart to cover early, mid and late season breeding.	Determine if there is a displacement, or avoidance effect caused by operation/project components located in proximity to FB 1.		Possible change in project operations as determined necessary through consultation with MNR and Northland Power Inc.  Possible habitat compensation in other areas of Manitoulin Island, as determined appropriate with MNR and NLP Inc.
Sites Supporting Area-sensitive Species: Forest Birds (FB 2)	Habitat displacement or avoidance effects due to operation of MMWF.		3 years post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan.		Within FB 2 (see Figure 3)	Post-construction surveys will take place in spring of 2014, 2015 and 2016.  Surveys will take place at least 3 times during the breeding season (Late May – Early July) and should be sampled at least 10 days apart to cover early, mid and late season breeding.	Determine if there is a displacement or avoidance effect caused by operation/project components located in proximity to FB2.		
Sites Supporting Area-sensitive Species: Open Country Breeding Birds (OCBB 3)	Habitat displacement or avoidance effects due to operation of MMWF.		3 years post-construction behavioural monitoring, consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan..		Within OCBB 3 (see Figure 4)	Post- construction surveys will take place in spring of 2014, 2015 and 2016.  Surveys will take place at least 3 times during the breeding season (Late May – Early July) and should be sampled at least 10 days apart to cover early, mid and late season breeding.	Determine if there is a displacement, or avoidance effect caused by operation/project components located in proximity to OCBB 3.		
Sites Supporting Area-sensitive Species: Open Country	Habitat displacement or avoidance effects due to operation of MMWF.				Within OCBB 4 (see Figure 4)	Post-construction surveys will take place in spring of 2014, 2015 and	Determine if there is a displacement, or avoidance effect caused by operation/project		

Breeding Birds (OCBB 4)						2016. Surveys will take place at least 3 times during the breeding season (Late May – Early July) and should be sampled at least 10 days apart to cover early, mid and late season breeding.	components located in proximity to OCBB 4		
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## **4.0 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).

### **4.1 Mortality Thresholds**

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

#### **4.1.1 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.

#### **4.1.2 Birds**

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

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

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

### **4.2 Post-Construction Monitoring Methods**

Post construction bat and bird mortality surveys estimate bird and bat mortality from wind turbines and may identify species and specific periods of high mortality. This 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 – 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 – 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 120m of 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.

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

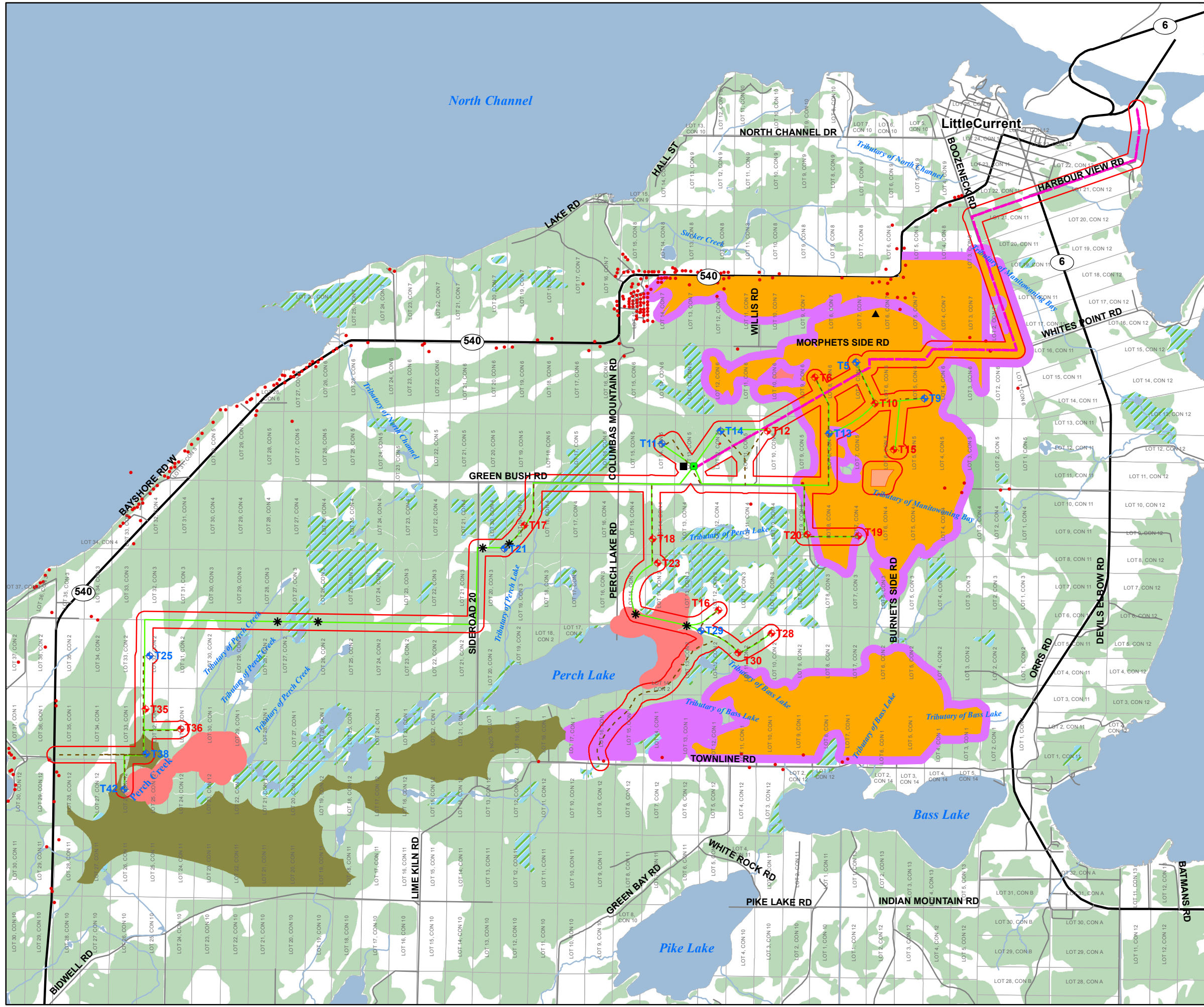
Minimum requirements for post-construction monitoring of bats include:

- Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) will be conducted during the core season when bats are active, and in coordination of bird mortality monitoring (May 1-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 – October 31; surveys for raptor mortality will be continued once per week during the month of November at the sampled turbines, and weekly during the winter months (December 1 – March 31) at turbines associated with RWFA (see **Table 1**).
- Bat and bird mortality surveys will occur at all turbines at wind power projects  $\leq 10$  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-October 31 survey period for evidence of raptor mortalities.
- For turbines located  $> 120$ m from bird SWH, 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).
- For turbines located within 120m of bird SWH, where mortality thresholds have been reached, mitigation must occur immediately.
- 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 10 turbines have been selected to cover representative areas throughout the project location (**Figure 5**). Post-construction monitoring will begin May 1<sup>st</sup> of the year that the wind power project is fully operational. The commercial operation date of the MMWF is end of year 2013; therefore, it is anticipated that post-construction monitoring will begin May 1, 2014.

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

**McLean's Mountain Wind Farm  
Figure 5: Location of Wind Turbines  
where Mortality Monitoring for Birds  
and Bats Will Occur Twice Weekly for  
3 Years**



**Legend**

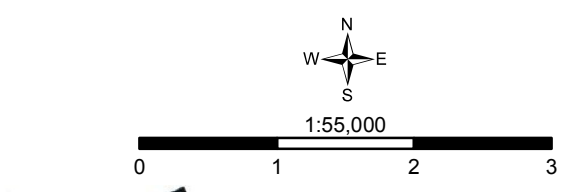
- ▲ MET Tower
- Residence
- Local Roads
- Highway
- 120 m Project Location Component Setback
- Lots/Concessions
- Water Body
- Watercourse
- Woodland
- Wetlands

**Natural Features to be Monitored (Post-Construction)**

- Waterfowl Nesting Areas
- Raptor Winter Feeding and Roosting Area
- Site Supporting Area-sensitive Species: Forest Birds
- Site Supporting Area-sensitive Species: Open Country Breeding Birds

**Project Location Components**

- ◆ Wind Turbine Locations
- ◆ 10 Turbines to be Monitored
- Substation
- Operations Building
- \* Horizontal Directional Drilling Access/Exit Pit
- Access Road
- Feeder Lines
- Transmission Line
- Construction Staging Area



## 4.2.2 Carcass Searches

Carcass searches will consider the following:

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

<b>%Vegetation Cover</b>	<b>Vegetation Height</b>	<b>Visibility Class</b>
≥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
- 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
  - Scavenged
- Bird carcasses found during mortality monitoring will be collected and stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition.
- Carcasses of the following species found during bat mortality searches will be stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition:
  - *Lasionycteris noctivagans* (Silver-haired Bat)
  - *Lasiurus cinereus* (Hoary Bat)
  - *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)
  - *Eptesicus fuscus* (Big Brown Bat)

#### 4.2.3 Carcass Removal Trials

The level of carcass scavenging must be determined through carcass removal trials. In these trials carcasses are placed around the wind turbines and monitored until they disappear. The average carcass removal time is a factor in determining the estimated bat or bird mortality. As carcass removal rates vary considerably from one site to another and seasonally, removal trials 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 and winter) 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.)
- Trials conducted during the spring, summer and fall must use a minimum of 10 carcasses, while winter trials must use a minimum of 5 carcasses. **No more than 5 trial carcasses placed at any one time.**
- Carcasses will be monitored every 3-4 days in conjunction with carcass searches
- Carcass removal trials will be conducted in a variety of weather conditions. Weather conditions will be recorded
- Carcasses will be distributed across the range of different substrates/habitats and visibility classes of turbines being searched
- To the extent possible, carcass removal trials will be conducted at turbines that are not part of the carcass search sub-sample
- Carcasses will be placed before dusk using gloves and boots to avoid imparting human smell that might bias trial results (e.g. attract scavengers, etc)
- Trials will continue until all carcasses are removed or have completely decomposed (generally 2 weeks)
- To avoid confusion with turbine related fatalities, trial carcasses will be discretely marked (e.g. clipping of ear, wing, fur; hole punching ear; etc.) with a unique identification so they can be identified as trial carcasses
- Carcasses used will be as fresh as possible since frozen or decomposed carcasses are less attractive to scavengers. If frozen carcasses are used, they will be thawed prior to beginning carcass removal trials.
- To the extent possible, with exception to winter, 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.
- Raptor carcasses will be used for winter carcass removal trials. In the event that the minimum requirement of 5 raptor carcasses for winter carcass removal trials cannot be sourced, there will be consultation with the MNR to discuss alternative solutions.

- 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.

#### 4.2.4 Searcher Efficiency Trials

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

Below are some important considerations for conducting searcher efficiency trials:

- Searcher efficiency trials will be conducted at least once a season (spring, 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. 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 discretely 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 will overlook some carcasses. This percentage will vary depending on the observer, the habitat and the area being searched, etc.

#### 4.2.5 Proportion Area Searched

Based on current Ontario post-construction data, most bats and birds appear to fall within 50m 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 searched, and a description of areas deemed to be unsearchable (e.g. vegetation height, type, slope, etc.), will be provided in the mortality report.

#### 4.2.6 Calculations

##### Scavenger Correction Factor

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

$$S_c = \frac{n_{\text{visit1}} + n_{\text{visit2}} + n_{\text{visit3}} + n_{\text{visit4}}}{n_{\text{visit0}} + n_{\text{visit1}} + n_{\text{visit2}} + n_{\text{visit3}}}$$

Where,

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

$n_{\text{visit0}}$  is the total number of carcasses placed

$n_{\text{visit1}} - n_{\text{visit4}}$  are the numbers of carcasses on visits 1 through 4

##### 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:

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

Where,

$S_{eo}$  is the overall searcher efficiency

$S_{e1}$  and  $2$  and  $3 \dots$  are individual searcher efficiency ratings

$N_1$  and  $2$  and  $3 \dots$  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 = 50m

### 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

#### 4.2.7 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 or mortality rates. In this case, the year is all reporting periods in one calendar year (i.e. from January 1 to December 31).
- Tissue samples from bat and bird carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin of migrants. The local MNR office may be contacted prior to disposing bat and bird carcasses, to determine if this type of research is occurring in the area.

### 4.3 Post-Construction Mitigation

#### 4.3.1 Bats

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.

#### **4.3.2 Birds**

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

For turbines located outside 120m 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 120m 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.

### **4.4 Contingency Plans**

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

#### **4.4.1 Bats**

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

#### 4.4.2 Birds

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

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

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

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

#### 5.0 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.

#### 6.0 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 2**.

**Table 2.** 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, 2014	February 2015
Year 2: May 1 – Nov 30, 2015	February 2016
Year 3: May 1 – Nov 30, 2016	February 2017

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 1 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](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**.

**Table 3.** 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 <b>Table 2</b> .
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 <b>Table 2</b> .
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.
2 raptors / wind power project (<10 turbines)	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.

## 7.0 References

OMNR. July 2011. *Bats and Bat Habitats: Guidelines for Wind Power Projects*. First Edition. Queen's Printer for Ontario, Canada.

OMNR. December 2011. *Birds and Bird Habitats: Guidelines for Wind Power Projects*. First Edition. Queen's Printer for Ontario, Canada.

# **APPENDIX A**

**Survey Protocols/Methods for:**

**Waterfowl Nesting Areas**

**Raptor Winter Feeding and Roosting Areas**

**Sites Supporting Area-sensitive Species: Forest Birds**

**Sites Supporting Area-sensitive Species: Open Country Breeding Birds**



# McLean's Mountain Wind Farm

## Behavioural Monitoring Methodology; Waterfowl Nesting Areas

The most significant waterfowl nesting sites are usually relatively large, undisturbed upland areas that provide nesting cover, with abundant ponds and wetlands. Waterfowl in the guild covered by this index commonly nest in upland habitat, usually grasslands, located near marshes and other wetlands, ponds, and lakes. Most nests are located within 100 m of water but it is not unusual to find nests 500 m or more from the water's edge. Once the eggs hatch, hens lead their broods overland to the water.

The wetland itself is used heavily by these birds throughout the year, but for successful reproduction, marshes must have an adequate supply of adjacent upland area offering habitat suitable for nesting.

Most waterfowl in this group select upland areas composed of grasses, sedges, rushes, and low shrubs. Some species will use adjacent hay fields as nesting sites. Species such as Wood Duck and Hooded Mergansers nest in cavities of trees located in swamps, shorelines of water bodies and sometimes in adjacent upland woods. The American Black Duck is known to nest in upland forest habitat, but often in or near beaver ponds in these upland areas. The exact species composition of the plant community seems to be a secondary consideration to the structure provided.

Upland habitat adjacent to a wetland should be wide enough so that predators like Raccoons, Red Foxes, Coyotes, and Striped Skunks have difficulty locating nests. These bands of cover around a wetland generally experience very high rates of nest predation.

For most species, except the pintail, presence of residual vegetation from previous years is important.

Upland habitats located adjacent to the following wetland ELC ecosite codes were considered when identifying candidate Waterfowl Nesting Areas:

- Marshes (MAS1, MAS2, MAS3, MAM1, MAM2, MAM3, MAM4, MAM5, MAM6);
- Aquatic (SAS1, SAM1, SAF1); and
- Swamps (SWT1, SWT2, SWD1, SWD2, SWD3, SWD4).

Three (3) Waterfowl Nesting Areas (see Figure 1) have been assumed significant within the McLean's Mountain Wind Farm project location. As a result, behavioural monitoring for 1 year pre-construction (2013) will be completed to confirm significance. If a Waterfowl Nesting Area (see Figure 1) is confirmed significant, in consultation with the MNR, and based on the data collected during pre-construction surveys, 3 years of post-construction (2014-2016) will be conducted. The post-construction monitoring will be consistent with MNR protocols and resulting data will be used to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan. Behavioural monitoring will follow the methodology outlined below.

### *Survey Methods:*

Surveys will be completed in the morning between 6 am and 10am, on days with low wind and good visibility. Sunny or bright (not overcast) days are best. Days with rain, heavy cloud cover, low temperatures and high winds affect mobility, dispersion and visibility of ducks and will be avoided, where possible. Replicate (second) counts will be done at the same time of day, over the same route and under approximately similar weather conditions.

Surveys are a modified area search conducted by walking the wetland perimeter. These surveys are best conducted by a team of two surveyors, who split up and each take half the wetland. For larger wetlands a boat or canoe can be used. Where shoreline is not accessible it will be scanned using binoculars. Observers will, where appropriate based on site conditions, walk through wetlands in order to observe waterfowl that may be out of sight due to dense vegetation or other obstructions.

Equipment will include binoculars, to scan shorelines, and in deep or larger wetlands chest waders and/or a canoe/boat. Two-way handheld radios will be used to ensure that any flushed birds are not counted more than once. Where possible, birds taking flight will be visually followed to locate their points of landing; birds landing on ponds yet to be assessed will be subtracted from the current count.

The selection of survey stations/transect locations within Waterfowl Nesting Areas will be done in consultation with the MNR, prior to pre-construction studies.

### *Monitoring Frequency and Timing:*

Surveys will be conducted twice; to account for early nesting (e.g. Mallards and Wood Ducks) and late nesting (e.g. Blue-winged Teal and Ring-necked Ducks) waterfowl species. The first survey event will occur in mid-April/early May and the second survey will occur in late May/early June.

### *Data Collection:*

Standard information collected in the field will include date, time, weather and observer names. The route walked will be mapped using a GPS. Observers will be experienced in waterfowl identification for the purpose of identifying the species and sex of waterfowl encountered. A complete list of all waterfowl species detected and comments regarding the behaviour of individual(s) observed along with a description of habitat will be collected.

For the purpose of count assessment, waterfowl populations are assumed to be 50:50 male to female, therefore each pair and each male duck encountered will represent a pair. For example, if 1 male and 1 female are observed = 1 pair, if a group of 3 males = 3 pairs, if two female and 1 male = 1 pair, if 1 lone female = 0 pairs, and large flocks (migrants) will not be counted.

All groupings of males from 2 to 10 should be considered part of a pair except for the following:

- Widgeon, Shoveler, Mallard and Pintail drakes in groups of five or less will be considered resident pairs, groups greater than that will not be counted.

Observers will be careful to observe duck movement on and between wetlands to ensure ducks are not double counted.

Where the first and second surveys indicate different numbers of breeding pairs of a certain species, the highest number of pairs from any single survey will be considered against criteria for significance. Results from the surveys will not be combined for a summed total.

Criteria for Significance:

Studies will confirm;

- Presence of 3 or more nesting pairs for listed species (below), excluding Mallards or;
- Presence of 10 or more nesting pairs of listed species (below) including Mallards or;
- Any active nesting site of an American Black Duck is considered significant.

*Species list*

- American Black Duck;
- Northern Pintail;
- Northern Shoveler;
- Gadwall;
- Blue-winged Teal;
- Green-Winged Teal;
- Wood Duck;
- Hooded Merganser; and
- Mallard.

# McLean's Mountain Wind Farm

## Behavioural Monitoring Methodology; Raptor Winter Feeding and Roosting Areas

Hay fields, pastures and open meadows provide critical winter roosting areas for hawks and owls in Ontario. Sites with key habitat components may attract large numbers of roosting birds, and multiple species may occasionally feed and roost together. Sites may be traditional, being used by birds year after year.

The following ELC ecosite codes were considered when identifying candidate Raptor Winter Feeding and Roosting Areas;

Forest – FOD - Deciduous Forest  
FOM- Mixed Forest  
FOC - Coniferous Forest

Upland - CUM – Cultural Meadow  
CUT – Cultural Thicket  
CUS – Cultural Savannah  
CUW – Cultural Woodland

Two (2) Raptor Winter Feeding and Roosting Areas (see Figure 2) have been assumed significant within the McLean's Mountain Wind Farm project location. As a result, behavioural monitoring for 1 year pre-construction (2013) will be completed to confirm significance. If a Raptor Winter Feeding and Roosting Area (see Figure 2) is confirmed significant, in consultation with MNR, and based on the data collected during pre-construction surveys, 3 years of post-construction (2014-2016) will be conducted. This post-construction monitoring will be consistent with MNR protocols and resulting data will be used to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan. Behavioural monitoring will follow the methodology outlined below.

### *Survey Methods:*

Surveys will be conducted from suitable vantage points throughout the habitat. Vantage points will be selected at locations where the habitat can be viewed without obstruction and suitable for viewing perching habitat. Surveys will be completed from within the habitat (leased lands) as opposed to roadside surveys or surveys from adjacent properties.

Surveys will be conducted for at least 30 minutes to allow enough time to thoroughly scan the woodland edge and field for indication of raptor perching or foraging.

Surveys will be conducted using binoculars and/or spotting scopes that are suitable for observing bird activity and identifying species composition (if possible), from the survey location.

The selection of vantage point/locations within Raptor Winter Feeding and Roosting Areas will be done in consultation with the MNR.

*Monitoring Frequency and Timing:*

Every 7-10 days in assumed significant habitat (see Figure 2) in January and February for a total of 6 visits per habitat.

Surveys should be conducted during daylight hours (9:00-16:00).

Data collection during surveys will include:

- Level of effort (including start and end time, date, time spent, weather conditions, etc.);
- GPS coordinates of route and vantage points;
- Complete list of wildlife species and their behaviour;
- Description of habitats or areas scanned during the survey; and
- Location of raptors observed will be recorded on field maps.

Criteria used to determine significance will include the following:

- One or more Short-eared Owls using the habitat is significant;
- At least 10 individuals and two of the listed indicator species; and

Indicator Species:

- Rough-legged Hawk;
- Red-tailed Hawk;
- Northern Harrier;
- American Kestrel; and
- Snowy Owl.

# McLean's Mountain Wind Farm

## Behavioural Monitoring Methodology; Sites Supporting Area-Sensitive Species: Forest Birds

Large, natural blocks of mature woodland habitat within the settled areas of Ontario are important habitats for area sensitive interior forest song birds.

The following ELC ecosite codes were considered when identifying candidate Forest Bird habitat:

- FOC
- FOM
- FOD
- SWC
- SWM
- SWD

Two (2) Sites Supporting Area-sensitive Species: Forest Birds (see Figure 3) have been considered significant, based on pre-construction surveys, within the McLean's Mountain Wind Farm project location. As a result, behavioural monitoring for 3 years post-construction (2014-2016) will be conducted consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan. Behavioural monitoring will follow the methodology outlined below.

Survey Methods:

Surveys will be conducted in late May, mid June and early July. Surveys will be completed between dawn (one half hour before sunrise) and 5 hours after sunrise.

Combined 10-minute fixed/non-fixed radius interior point counts will be used to establish quantitative estimates of bird abundance of interior forest areas of the project location. The selection of point count locations will be consistent with those surveyed pre-construction (see Figure 3). Where appropriate to provide additional coverage, alternate and/or additional point count locations will be chosen in consultation with the MNR.

Point counts will be repeated three times over the course of each breeding season (Visit 1 – late May; Visit 2 – mid-June; Visit 3 – early July) to ensure that early, mid and late breeders are detected. Surveys will be completed under appropriate weather conditions (i.e., low wind, no rain...)

Average species density for all visits per hectare will be calculated based on Blancher et al. 2007 formula (Density =  $(n * P * T) / (Pi * DD)$ ), Ontario Breeding Bird Atlas detection distances and time of day adjustment Blancher and Couturier 2007.

*Monitoring Frequency and Timing:*

Stations will be monitored twice during the breeding season.

Point counts will be conducted early in the morning between dawn (one half hour before sunrise) and about 5 hours after sunrise.

*Data Collection:*

This is a summary of data that is required for each survey station and will be replicated 3 times over the breeding season.

- Number of birds of each species detected per station; and
- A record of bird species that are flying over the habitat will be recorded separately as "flyovers".

Additional information that will be recorded includes:

- Weather conditions (temperature, wind speed (on Beaufort scale), percent cloud cover, and presence of precipitation;
- Date and time of day;
- GPS coordinates of the point location; and
- Name of the observer doing the field work.

Criteria used to determine significance will include the following:

Presence of nesting or breeding of 2 or more of the species listed below:

- Nuthatch (red-breasted and white-breasted);
- Veery;
- Blue-headed Vireo;
- Northern Parula;
- Black-throated Green Warbler;
- Blackburnian Warbler;
- Black-throated Blue Warbler;
- Ovenbird;
- Scarlet Tanager; and
- Winter Wren.

Any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.

# McLean's Mountain Wind Farm

## Behavioural Monitoring Methodology; Sites Supporting Area-Sensitive Species: Open Country Breeding Birds

Large continuous tracts of grassland habitat are declining throughout Ontario and North America. Many grassland species have experienced significant declines over the past 30 years.

The following ELC ecosite codes were considered when identifying candidate Open Country Bird Breeding habitat;

- CUM1
- CUM2

Two (2) Sites Supporting Area-sensitive Species: Open Country Breeding Bird Habitat (see Figure 4) have been considered significant, based on pre-construction surveys, within the McLean's Mountain Wind Farm project location. As a result, behavioural monitoring for 3 years post-construction (2014-2016) will be conducted consistent with MNR protocols, to assess impacts of the project on birds for the purpose of advising on mitigation strategies to be used as part of an adaptive management plan. Behavioural monitoring will follow the methodology outlined below:

### *Survey Methods:*

Surveys will be conducted in late May, mid June and early July. Surveys will be completed between dawn (one half hour before sunrise) and 5 hours after sunrise.

Combined 10-minute fixed/non-fixed radius interior point counts will be used to establish quantitative estimates of bird abundance of interior forest areas of the project location. The selection of point count locations will be consistent with those surveyed pre-construction (see Figure 3). Where appropriate to provide additional coverage, alternate and/or additional point count locations will be chosen in consultation with the MNR.

Point counts will be repeated three times over the course of each breeding season (Visit 1 – late May; Visit 2 – mid-June; Visit 3 – early July) to ensure that early, mid and late breeders are detected. Surveys will be completed under appropriate weather conditions (i.e., low wind, no rain...)

Average species density for all visits per hectare will be calculated based on Blancher et al. 2007 formula (Density =  $(n * P * T) / (Pi * DD)$ , Ontario Breeding Bird Atlas detection distances and time of day adjustment Blancher and Couturier 2007.



*Monitoring Frequency and Timing:*

Stations will be monitored twice during the breeding season.

Point counts will be conducted early in the morning between dawn (one half hour before sunrise) and about 5 hours after sunrise.

*Data Collection:*

This is a summary of data that is required for each survey station and will be replicated 3 times over the breeding season.

- Number of birds of each species detected per station; and
- A record of bird species that are flying over the habitat which should be recorded separately as "flyovers".

Additional information that should be recorded include:

- Weather conditions (temperature, wind speed (on Beaufort scale), percent cloud cover, and presence of precipitation;
- Date and time of day;
- GPS coordinates of the point location; and
- Name of the observer doing the field work.

Criteria used to determine significance will include the following:

Presence of nesting or breeding of 2 or more of the listed species

- Upland Sandpiper;
- Grasshopper Sparrow;
- Vesper Sparrow;
- Northern Harrier; and
- Savannah Sparrow.

A field with 1 or more breeding Short-eared Owls is to be considered SWH.