SUMMERHAVEN WIND ENERGY CENTRE
Renewable Energy Approval
Modifications Document

Prepared for:
Summerhaven Wind, LP
390 Bay Street, Suite 1720
Toronto, ON, M5H 2Y2

Project No. 1269 Date: January 2015

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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Project Team:

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Report submitted on January 26, 2015

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1.0 Project Description

The Summerhaven Wind Energy Centre (WEC) is owned and operated by Summerhaven Wind, LP, a subsidiary of NextEra Energy Canada, LP (NextEra). The Summerhaven WEC is located near the Town of Nanticoke within Haldimand County, Ontario, and consists of 56 wind energy generating turbines with a maximum capacity of approximately 129MW.

The Summerhaven WEC received Renewable Energy (REA) Approval (2484-8RQUS4) on March 16, 2012 from the Ministry of the Environment (MOE). As part of this approval, post-construction commitments were identified along with the commitment for the proponent to inform the Ministry of Natural Resources (MNR) of any changes made to the project that would alter the methodology in the *Post-construction Follow-up Plan* (see REA Approval letter - Condition I2). The *Natural Heritage Assessment (NHA) Amendment Report* identifies and discusses the existing commitments, and the proposed amendments to any documents associated with the *Natural Heritage Assessment* of the Summerhaven WEC.

2.0 Overview of Project Changes

In the time since the Summerhaven WEC became operational, changes to the approved REA conditions are being pursued for the overall purpose of reducing potential impacts to bats during the operational phase of this project. The proposed change includes postponing the requirement for operational mitigation measures (if necessary) at this project while a 3-year comprehensive study and comparison of bat activity, mortality, and atmospheric conditions is completed. The implementation of operational mitigation during this time period would skew the results of the study and nullify the potential benefits of this study to refine our understanding of the relationship between bat activity and mortality around operational turbines. The proposed change is only relevant to operational mitigation proposed for bats, and will not affect the daytime operational mitigation strategies for birds (if required).

The goal for the research project is to develop a research-based mitigation strategy that would minimize the impact of wind development on bat populations in the province by developing a model that considers all seasonal, temporal, and atmospheric variables that may contribute to bat mortality rather than implementing a program that focuses solely on the time period of July 15th to September 30th. The design of the specific operational mitigation measures for the Summerhaven WEC, if necessary, will be developed based on the results of the research initiative. The specific approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation.

The changes being proposed to the operational commitments for the Summerhaven WEC include postponing the implementation of operational mitigation (if necessary), as well as the associated changes in the monitoring program that would be associated with the possible delayed implementation of mitigation measures. In addition, the design of the specific operational mitigation measures for the Summerhaven WEC will be developed based on the results of the research initiative, and will be approved by the MNR prior to implementation. In addition, since the Summerhaven WEC did not become operational until August 2013, post-construction monitoring could not begin in 2013 as identified initially. As such, post-construction monitoring for this project will instead begin in 2014.

3.0 Changes to Approved Documentation

As part of the final REA approval, several documents that were approved by the Ministry of Natural Resources (MNR) may have referenced the commitments to implement operational mitigation measures (if necessary) and to conduct effectiveness monitoring once those measures have been implemented. A separate *Summerhaven Wind Energy Centre: Natural Heritage Assessment Amendment Report* (NRSI 2013a) has been prepared and submitted to the MNR for the purpose of confirming the proposed changes to the REA conditions and environmental commitments. The above mentioned document confirms that changes are required to 2 documents; the *Natural Heritage Assessment Report* (Golder 2012), and the *Environmental Effects Monitoring Plan* (EEMP) (Golder 2011). Each of the natural heritage documents is discussed in more detail in the sections below.

The re-confirmation received from the MNR has been included with this report (Appendix D).

3.1 Changes to the Natural Heritage Assessment

The existing operational mitigation commitments for the Summerhaven WEC are currently outlined in Sections 5.3.4.1.3 (page 169), and 5.3.5.2 (page 178) of the *Natural Heritage Assessment (NHA) Report* (Golder 2012). According to the NHA Report, "*If the threshold level of bat mortality which is ultimately agreed to by MNR is reached (presently 10 bats per turbine, per year averaged over the entire project), operational mitigation through modifying the wind turbine cut-in speed to 5.5m/sec will occur and additional monitoring may be required, based on further consultation with MNR. If a threshold is exceeded, operational mitigation must be employed for the life of the Project, and additional monitoring would likely be required pending further consultation with the MNR*." The proposed changes to the NHA Report are outlined in Section 3.4 below.

3.2 Changes to the Environmental Effects Monitoring Plan

Operational mitigation commitments for the Summerhaven WEC are also outlined in Sections 1.4 (page 16) of the *Environmental Effects Monitoring Plan* (EEMP) (Golder 2011). According to the EEMP, "*For bats, operational mitigation is required if post-*

construction monitoring shows that a wind power project is causing significant bat mortality. Bat mortality is considered by the Guideline to be significant when mortality levels at a project location exceed 10 bats/turbine/year. Operational mitigation for bat mortality consists of changing the wind turbine cut-in speed to 5.5m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5m/s. Where a post-construction monitoring annual report indicates the annual bat mortality threshold of 10 bats/turbine/year has been exceeded, operational mitigation will be implemented across the wind 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. Where post-construction mitigation is applied, an additional 3 years of effectiveness monitoring is required".

In addition, Table 3 in the EEMP Report outlines that post-construction surveys, including bat displacement surveys, and bird and bat mortality monitoring would be conducted in each of the 2013, 2014 and 2015 monitoring years.

The proposed changes to the EEMP Report are outlined in Section 3.4 below.

3.3 Changes to the Post-construction Follow-up Plan

No specific Post-construction Follow-up Plan (PCFP) has been submitted to the MNR for this project. The details of this PCFP are already included in the NHA and EEMP reports, as outlined in the sections above. The PCFP for this project that is submitted to the MNR will be consistent with the amendments described below, where applicable.

3.4 Proposed Natural Heritage Amendments

NextEra is proposing to conduct an extensive bat research initiative in Ontario. The goal for this project is to develop a research-based mitigation strategy that would minimize the impact of wind development on bat populations in the province by developing a model that considers all seasonal, temporal, and atmospheric variables that may contribute to bat mortality rather than implementing a program that focuses solely on the time period of July 15th to September 30th. A model will be developed using atmospheric variables to predict the time periods where the risk of bat mortality is the highest. In addition to the development of a large bat activity database, the project will allow NextEra to proactively implement an adaptive bat mitigation strategy that will potentially

reduce bat mortality at NextEra's wind projects in Ontario, including the Summerhaven WEC. The design of the specific operational mitigation measures for the Summerhaven WEC will be developed based on the results of the research initiative, and may differ from the MNR's recommended approach of changing the wind turbine cut-in speed to 5.5 m/s, or feathering of wind turbine blades when wind speeds are below 5.5 m/s at all turbines from sunset to sunrise, and from July 15 to September 30 (MNR 2011). The approach to operational mitigation resulting from this research initiative will be reviewed by the Technical Advisors identified in the attached Study Plan (Appendix B), and will be approved by the MNR, prior to being implemented. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may be considered by other wind facility operators in Ontario. Additional details regarding the bat research initiative are outlined in Section 4.0 below and in the *Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario* (Appendix B).

Acoustic bat monitoring and mortality monitoring is being conducted at the Summerhaven WEC in 2014 and 2015, allowing for the bat mortality model to be refined and tested in 2015. In the event that the bat mortality threshold is surpassed at the Summerhaven WEC in either of the first 2 mortality monitoring years (2014 or 2015), NextEra is proposing to postpone the implementation of operational mitigation until 2016, to allow for the collection of accurate bat mortality data that can be correlated to the acoustic monitoring data from the 2 monitoring years.

In addition, since the Summerhaven WEC did not become operational until August 2013, post-construction monitoring could not begin in 2013 as outlined in the EEMP Report (Table 3). As such, post-construction monitoring for this project will instead begin in 2014. This change in timing was confirmed by the MNR through an email dated May 2013 (MNR, *pers. comm*.).

The proposed amendments for this project have been summarized in Table 1 below.

Table 1. Natural Heritage Amendments for the Summerhaven Wind Energy Centre

Mitigation Measure or Monitoring Commitment	Details of the Existing Commitment	Proposed Amendment
Operational Mitigation Measures (Sections 5.3.4.1.3 and 5.3.5.2 of the NHA, Section 1.4 of the EEMP, and Condition I2 of the REA Approval letter)	Operational mitigation measures will be implemented in the event that the MNR's bat mortality threshold (10 bats/turbine/year) is exceeded based on the results of post-construction mortality monitoring at the Summerhaven WEC, which is scheduled to begin in May 2014. Operational mitigation for bat mortality consists of changing the wind turbine cut-in speed to 5.5m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5m/s. Where a post-construction monitoring annual report indicates the annual bat mortality threshold of 10 bats/turbine/year has been exceeded, operational mitigation will be implemented across the wind 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.	In the event that the bat mortality threshold (10 bats/turbine/year) is surpassed at the Summerhaven WEC in either of the first 2 mortality monitoring years (2014-2015), NextEra is proposing to postpone the implementation of operational mitigation until 2016, to allow for the collection of accurate bat mortality data that can be correlated to the acoustic monitoring data from the 2 monitoring years. In 2016, and if necessary, the design of the specific operational mitigation measures for the Summerhaven WEC will be developed based on the results of the bat research initiative. The results of the data collection, predictive model, and overall approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may also be considered by other wind facility operators in Ontario.
Effectiveness Monitoring (Sections 5.3.4.1.3 and 5.3.5.2 of the NHA, Section 1.4 of the EEMP, and Condition I2 of the REA Approval letter)	An additional 3 years of post-construction mortality monitoring (effectiveness monitoring) is required in the event that the bat mortality threshold is surpassed.	Three years of additional post-construction mortality (i.e. effectiveness) monitoring will be implemented (if needed) in the event that the bat mortality threshold is surpassed at this project; however, the start of these 3 years of additional monitoring will coincide with the implementation of operational mitigation, rather than based on the date the mortality threshold is first exceeded.
Post-construction Monitoring (Table 3 of the EEMP Report)	Post-construction monitoring, including bat displacement surveys, and bird and bat mortality monitoring will be conducted in each of the 2013, 2014 and 2015 monitoring years.	Since the Summerhaven WEC did not become operational until August 2013, the beginning of post-construction monitoring will be postponed until 2014. Monitoring will be conducted in each of 2014, 2015 and 2016.

4.0 Research Study Design

The rational for the proposed change in the already approved REA conditions is for the purpose of implementing a comprehensive research study without the influence or bias that would result if operational mitigation was implemented during the study. The purpose and methods of the study have been briefly summarized below, with a more comprehensive study design prepared by Normandeau Associates Inc. provided in Appendix B.

4.1 Purpose of the Research Study

The information currently available is limited and does not provide a comprehensive understanding of the factors contributing to bat mortality. As a result, agency recommended mitigation measures do not account for atmospheric conditions, seasons, or time periods within the July 15th to September 30th time period when bats may actually be at low risk. Similarly, current provincial requirements also do not allow for flexibility to protect bats outside of July 15th to September 30th timing window when site-specific conditions may actually result in bats being at a higher risk.

The purpose of this research program is to gain a better understanding of the conditions (i.e. seasonal, temporal, spatial, atmospheric, etc.) that contribute to a potential higher risk of interaction between bat activity and operational wind turbines. With this understanding, it will be possible to develop site-specific curtailment strategies that look at a larger set of variables for a broader protection of bats throughout the year, at all times of night, and in all weather conditions by allowing for curtailment of operational turbines to accommodate and avoid periods when bat activity (and associated risk of mortality) is expected to be highest.

4.2 Research Study Methods and Implementation

NextEra is proposing to conduct an extensive bat research initiative in Ontario. The goal for this project is to develop a research-based mitigation strategy that would minimize the impact of wind development on bat populations in the region, while maximizing renewable energy output. A model will be developed using atmospheric variables to predict the time periods where the risk of bat mortality is the highest. In addition to the development of a large bat activity database, the project will allow NextEra to proactively

implement an adaptive bat mitigation strategy that will potentially reduce bat mortality at NextEra's wind projects in Ontario, including the Summerhaven WEC.

The research will enable the development and proactive implementation of 'smart curtailment' models. As a result of the model implementation, turbines can be programmed to curtail operations automatically when the identified atmospheric conditions are forecast to occur. If these models are developed and implemented, both bats, and the wind energy facility, will benefit by decreasing bat mortality and increasing the capacity factor of the renewable energy facility. The approach to operational mitigation resulting from this research initiative will be reviewed by the Technical Advisors identified in the attached Study Plan (Appendix B), and will be approved by the MNR, prior to being implemented. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may also be considered by other wind facility operators in Ontario. Additional details regarding the bat research initiative are outlined in the *Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario* (Appendix B).

Both the research and model development would be conducted by Normandeau. Normandeau has conducted similar research and modeling in the western and mid-western United States. NextEra will be fully funding this research. The MNR has indicated strong support for this research project, and it will be completed with input from the MNR, and the MOE, as well as academic institutions, bat experts in Ontario, and several environmental groups. Throughout the process, NextEra would work closely with the MNR and MOE, and would provide periodic updates on the status of the initiative, as well as access to the data collected.

4.3 Expert Consultation and Involvement

The development of this research study has been completed with the assistance and guidance of several disciplinary experts and agency staff, and will be carried out by experienced biologists to ensure high quality results. A brief summary of disciplinary experts, organizations, and agencies that will be involved in the development, implementation, and deliverables associated with this research study is provided in Table 2 below.

Table 2. Disciplinary Expert and Agency Staff Roles and Involvement

Organization	Role	Description of Involvement
Bat Conservation International	Biological Advisor	Cris Hein, the Bats and Wind Energy Program Coordinator at BCI, will provide input on the methods and study design and will provide technical review of data collection and modeling process.
Bird Studies Canada	Biological Advisor	Staff at BSC will play a technical advisory role in the project, assisting in the data collection and model development process.
Dr. Brock Fenton	Biological Advisor	Dr. Fenton is a leading expert in the field of bat ecology. He will provide input on study design, consideration of atmospheric and landscape variables, and will review the ecological validity of the model, once complete.
Environment Canada		
Highland Statistics, Ltd.	Statistical Advisor	Highland Statistics is a highly specialized ecological modeling firm that will provide project-specific modeling and statistical input on the research design, analysis, and modeling.
Ministry of Natural Resources		
Natural Resource Solutions Inc.	Mortality Monitoring	NRSI will conduct comprehensive post-construction mortality monitoring in accordance with provincial guidelines to characterize the impacts on individual bat species for the purpose of comparison to acoustic monitoring and entering into the predictive modeling.
NextEra Energy Canada	Project Coordinator	NextEra will coordinate the involvement of all agencies and organizations on the project.
Normandeau Associates	Acoustic and Atmospheric Monitoring	Normandeau will install acoustic detectors and monitor the acoustic activity and atmospheric conditions at each sample location. This information will be combined with mortality data and developed into the predictive model.

5.0 Environmental Considerations

As part of the detailed review of the proposed changes to the Renewable Energy Approval, NRSI has considered the environmental implications of such a change to the proposed operational mitigation strategy of the Summerhaven Wind Energy Centre. A summary of the environmental considerations, both positive and negative, have been summarized in the sections below.

5.1 Environmental Benefits

The proposed changes to the Renewable Energy Approval, and associated approval conditions, at the Summerhaven WEC are being presented because they are expected to provide a long-term benefit to bats in the vicinity of the Summerhaven WEC and throughout Ontario. It is expected that the results of the study, or at least concept of the study, will also be directly applicable to facilities throughout North America, resulting in a wide-spread benefit to bat populations and researchers, alike. A brief summary of the key environmental benefits can be found in the following sections.

5.1.1 Reduced Bat Mortality at Operational Wind Facilities

The proposed research program enables the development and implementation of proactive 'smart curtailment' models. Bat activity is influenced by various atmospheric conditions (i.e. wind speed, temperature, portion of moon illumination, and possibly other factors), and the influence of these factors varies by season, time of night, and geographic region (Baerwald and Barclay 2011; Weller and Baldwin 2012; Hooton et al. 2012). A model will be developed using these atmospheric variables to predict the seasonal and time periods where the risk of bat mortality is the highest. As a result of the model implementation, turbines will be able to be programmed to curtail operations automatically when the identified atmospheric conditions are forecast to occur.

This development of this model allows NextEra to proactively implement an adaptive bat mitigation strategy specific to this project for the purpose of reducing bat mortality in an effort to keep mortality levels below the bat mortality threshold published in the MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (MNR 2011). This approach is expected to result in significant reductions in bat mortality at the Summerhaven Wind Energy Centre, with direct application to other NextEra wind projects that are expected

to be operational in the next few years, resulting in a wide-spread opportunity for environmental benefit to bats across Ontario. The proposed use of this model would be to implement aspects of the 'smart curtailment' *before* mortality thresholds are triggered, ultimately resulting in a proactive conservation benefit to all of Ontario's bat species.

In addition, the results of the research may lead to long term mitigation strategies that could be deployed at other wind facilities elsewhere in the province, across Canada, or throughout North America.

5.1.2 Minimized Risk to Species at Risk Bats

As White-nose Syndrome continues to spread throughout Ontario and Canada, every step to minimize potential impacts to Species at Risk bats is becoming more important. As described above, the proposed research project and development of a 'smart curtailment' introduces the possibility of curtailing turbine operations based on very specific environmental conditions and observed activity patterns. Through implementation of this proactive study, potential risks to current, and future, bat Species at Risk will be minimized, resulting in a conservation benefit to these species.

5.1.3 Increased Understanding of Bat Activity Patterns

The development of the bat activity and mortality model requires the collection of bat acoustic data in order to measure bat activity levels. This data will be collected at the Summerhaven WEC in 2014 and 2015, as well as several other operational NextEra facilities in upcoming years. The creation of such a large dataset of bat acoustic data will provide a valuable opportunity to investigate the activity of both resident and migratory bat species in Ontario. Not only does this data allow for the creation of the predictive 'smart curtailment' model, but it can provide insights into other behavioral cues and triggers that can benefit bat conservation work throughout the province. A better understanding of bat foraging, reproductive, and both short-distance and long-distance migratory behavior can help both policymakers and conservation organizations to prioritize species conservation measures, such as the acquisition or protection of habitat.

Given the inherent difficulty in studying bat activity, available data sets are generally limited temporally and/or spatially and provide focused information for the purpose of discussing research objectives and targets. The overall environmental benefit of

obtaining such a large data set at elevated monitoring stations provides considerable conservation opportunities.

5.2 Environmental Concerns

The proposed changes in the approach to operational mitigation at this facility has considerable opportunity for an overall environmental benefit to bat populations within Ontario, but it is in absence of possible environmental concerns related to this approach.

If this project exceeds the provincial bat threshold of 10 bats/turbine/year during either of the first 2 years (2014-2015) while the research program is being undertaken, the onset of operational mitigation would be delayed until after the study has been completed. In this scenario, it is likely that the Summerhaven WEC would impact more bats during the remaining research years than if the operational mitigation measures were implemented immediately. However, despite the risk of not immediately implementing operational mitigation if the threshold is exceeded, the potential benefits of applying a 'smart curtailment' for future years at this project, and others within Ontario, is still expected to have an overall benefit to bats across Ontario.

5.3 Other Benefits

Wind energy's impacts on wildlife in general have been shown to be minor when compared to the impacts of other energy generation technologies (CANWEA 2013). Wind energy plays a critical role in fostering a clean environment and mitigating the pressing issue of climate change, which is a significant threat to a number of species. Wind power can play a major role in solving the multiple challenges related to climate change, including the need for immediate reduction on our reliance on fossil fuels and, in turn, associated greenhouse gas reductions. Wind energy production also emits no pollution or greenhouse gases, requires no mining or drilling for fuel, produces negligible amounts of waste, and utilizes no water in the generation of electricity.

Therefore, maximizing the availability of wind energy projects to generate electricity is a significant benefit to the environment, and to bat species in particular. The 'smart curtailment' approach to operational mitigation allows NextEra to maximize renewable energy generation at the same time as maintaining protective measures to minimize potential impacts to bats. Under this approach, turbines are curtailed when the

atmospheric conditions that pose the greatest risk of bat mortality are forecast to occur. These conditions could occur outside of the July 15th to September 30th bat mitigation window identified in the *Bats and Bat Habitats: Guidelines for Wind Power Projects* (MNR 2011). Therefore, there is a conservation benefit to bats by identifying and predicting the real-life conditions during which bat mortality is expected to be highest, and focusing the operational mitigation (curtailment) strategy on those occurrences, rather than focusing only on the period of July 15th to September 30th. Similarly, there may be periods of time during the July 15th to September 30th time frame in which bat activity has been shown to be unlikely to occur, for example during periods of high wind speed or precipitation. The 'smart curtailment' model will allow NextEra to operate its wind projects normally during the periods of low risk to bats, and to proactively implement operational mitigation if atmospheric conditions correlated with high bat mortality are forecast to occur.

6.0 References

Publications

Baerwald, E. F., and R. M. R. Barclay. 2011. Patterns of activity and fatality of migratory bats at a wind energy facility in Alberta, Canada. Journal of Wildlife Management 75(5):1103–1114.

Canadian Wind Energy Association, 2013. Wind Facts: Environment & Wildlife. http://windfacts.ca/environment-wildlife

Golder Associates Limited. 2012. Summerhaven Wind Energy Centre Environmental Effects Monitoring Plan. January 2012.

Golder Associates Limited. 2011. Summerhaven Wind Energy Centre Natural Heritage Assessment Report. May 2011.

Hooton, L. A., C. Sutter, A. Costello, and G. Forcey. 2012. The influence of specific atmospheric variables on fall bat activity varies among geographic regions and species. Wind Wildlife Research Meeting IX; Denver, Colorado.

Ministry of Natural Resources (MNR). 2011. Bats and Bat Habitats: Guidelines for Wind Power Projects. July 2011.

Natural Resource Solutions Inc. (NRSI). 2013a. Summerhaven Wind Energy Centre Natural Heritage Assessment Amendment Report. November 2013.

Weller, T. J., and J. A. Baldwin. 2012. Using echolocation monitoring to model bat occupancy and inform mitigations at wind energy facilities. Journal of Wildlife Management. 76(3):619-631.

Personal Communication

Ontario Ministry of Natural Resources (MNR). 2013. Summerhaven Wind Energy Centre - Landbird Migration Surveys. Email correspondence with MNR employee May 2013.

Appendix A
Summerhaven Wind Energy Centre: Natural Heritage Assessment Amendment Report

SUMMERHAVEN WIND ENERGY CENTRE
Natural Heritage Assessment
Amendment Report

Prepared for:
Summerhaven Wind, LP
390 Bay Street, Suite 1720
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The goal for the research project is to develop a research-based mitigation strategy that would minimize the impact of wind development on bat populations in the province by developing a model that considers all seasonal, temporal, and atmospheric variables that may contribute to bat mortality rather than implementing a program that focuses solely on the time period of July 15th to September 30th. The design of the specific operational mitigation measures for the Summerhaven WEC, if necessary, will be developed based on the results of the research initiative. The specific approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation.

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3.0 Changes to the Natural Heritage Documentation

As part of the final REA approval, several documents have the potential to reference specific commitments to implement operational mitigation measures, study the potential impacts to birds and bats at the facility, and/or implement effectiveness monitoring should operational mitigation measures be implemented at this facility. Each of these documents has been reviewed to determine whether specific changes to each document is needed as part of this proposed change in the operational commitments of this project. Each relevant document is discussed in more detail in the sections below.

3.1 Changes to the Natural Heritage Assessment

The existing operational mitigation commitments for the Summerhaven WEC are currently outlined in Sections 5.3.4.1.3 (page 169), and 5.3.5.2 (page 178) of the *Natural Heritage Assessment (NHA) Report* (Golder 2012). According to the NHA Report, "*If the threshold level of bat mortality which is ultimately agreed to by MNR is reached (presently 10 bats per turbine, per year averaged over the entire project), operational mitigation through modifying the wind turbine cut-in speed to 5.5m/sec will occur and additional monitoring may be required, based on further consultation with MNR. If a threshold is exceeded, operational mitigation must be employed for the life of the Project, and additional monitoring would likely be required pending further consultation with the MNR*." The proposed changes to the NHA Report are outlined in Section 3.4 below.

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by the Technical Advisors identified in the attached Study Plan (Appendix B), and will be approved by the MNR, prior to being implemented. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may be considered by other wind facility operators in Ontario. Additional details regarding the bat research initiative are outlined in the *Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario* (Appendix B).

Acoustic bat monitoring and mortality monitoring is being conducted at the Summerhaven WEC in 2014 and 2015, allowing for the bat mortality model to be refined and tested in 2015. In the event that the bat mortality threshold is surpassed at the Summerhaven WEC in either of the first 2 mortality monitoring years (2014 or 2015), NextEra is proposing to postpone the implementation of operational mitigation until 2016, to allow for the collection of accurate bat mortality data that can be correlated to the acoustic monitoring data from the 2 monitoring years.

In addition, since the Summerhaven WEC did not become operational until August 2013, post-construction monitoring could not begin in 2013 as outlined in the EEMP Report (Table 3). As such, post-construction monitoring for this project will instead begin in 2014. This change in timing was confirmed by the MNR through an email dated May 2013 (MNR, *pers. comm*.).

The proposed amendments for this project have been summarized in Table 1 below.

Table 1. Natural Heritage Amendments for the Summerhaven Wind Energy Centre

Mitigation Measure or Monitoring Commitment	Details of the Existing Commitment	Proposed Amendment
Operational Mitigation Measures (Sections 5.3.4.1.3 and 5.3.5.2 of the NHA, Section 1.4 of the EEMP, and Condition I2 of the REA Approval letter)	Operational mitigation measures will be implemented in the event that the MNR's bat mortality threshold (10 bats/turbine/year) is exceeded based on the results of post-construction mortality monitoring at the Summerhaven WEC. Operational mitigation for bat mortality consists of changing the wind turbine cut-in speed to 5.5m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5m/s. Where a post-construction monitoring annual report indicates the annual bat mortality threshold of 10 bats/turbine/year has been exceeded,	In the event that the bat mortality threshold (10 bats/turbine/year) is surpassed at the Summerhaven WEC in either of the first 2 mortality monitoring years (2014-2015), NextEra is proposing to postpone the implementation of operational mitigation until 2016, to allow for the collection of accurate bat mortality data that can be correlated to the acoustic monitoring data from the 2 monitoring years. In 2016, and if necessary, the design of the specific operational mitigation measures for the Summerhaven WEC will be developed based on the results of the bat research

	operational mitigation will be implemented across the wind 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.	initiative. The results of the data collection, predictive model, and overall approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may also be considered by other wind facility operators in Ontario.
Effectiveness Monitoring (Sections 5.3.4.1.3 and 5.3.5.2 of the NHA, Section 1.4 of the EEMP, and Condition I2 of the REA Approval letter)	An additional 3 years of post-construction mortality monitoring (effectiveness monitoring) is required in the event that the bat mortality threshold is surpassed.	Three years of additional post-construction mortality (i.e. effectiveness) monitoring will be implemented (if needed) in the event that the bat mortality threshold is surpassed at this project; however, the start of these 3 years of additional monitoring will coincide with the implementation of operational mitigation, rather than based on the date the mortality threshold is first exceeded.
Post-construction Monitoring (Table 3 of the EEMP Report)	Post-construction monitoring, including bat displacement surveys, and bird and bat mortality monitoring will be conducted in each of the 2013, 2014 and 2015 monitoring years.	Since the Summerhaven WEC did not become operational until August 2013, the beginning of post-construction monitoring will be postponed until 2014. Monitoring will be conducted in each of 2014, 2015 and 2016.

4.0 Summary of Natural Heritage Amendments

Following the review of proposed amendments to the Summerhaven WEC (as discussed above), NRSI has re-considered all aspects of the Natural Heritage Assessment, and other associated documents, to determine if there are changes required to mitigation measures or monitoring commitments to ensure that potential permanent or adverse environmental impacts are mitigated and studied appropriately. The summary of the result of this review are summarized in Table 2 below.

Table 2. Summary of Natural Heritage Amendments for the Summerhaven Wind Energy Centre

Mitigation Measure or Monitoring Commitment	Amendment Result
Operational Mitigation Measures	In the event that the bat mortality threshold (10 bats/turbine/year) is surpassed at the Summerhaven WEC in either of the first 2 mortality monitoring years (2014-2015), operational mitigation will be postponed until 2016, to allow for the collection of accurate bat mortality data that can be correlated to the acoustic monitoring data from the 2 monitoring years. In 2016, and if necessary, the design of the specific operational mitigation measures for the Summerhaven WEC will be developed based on the results of the bat research initiative. The results of the data collection, predictive model, and overall approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation. The results of the study will also be made available to the public, so that the recommendations for operational mitigation may also be considered by other wind facility operators in Ontario.
Effectiveness Monitoring	Three years of additional post-construction mortality monitoring (effectiveness monitoring) will be implemented in the event that the bat mortality threshold is surpassed at this project; however, the start of these 3 years of additional monitoring will coincide with the implementation of operational mitigation, rather than based on the date the mortality threshold is first exceeded.
Post-construction Monitoring	Since the Summerhaven WEC did not become operational until August 2013, the beginning of post-construction monitoring will be postponed until 2014. Monitoring will be conducted in each of 2014, 2015 and 2016.

5.0 References

Publications

Golder Associates Limited. 2012. Summerhaven Wind Energy Centre Environmental Effects Monitoring Plan. January 2012.

Golder Associates Limited. 2011. Summerhaven Wind Energy Centre Natural Heritage Assessment Report. May 2011.

Ministry of Natural Resources. 2011. Bats and Bat Habitats: Guidelines for Wind Power Projects. July 2011.

Personal Communication

Ontario Ministry of Natural Resources (MNR). 2013. Summerhaven Wind Energy Centre - Landbird Migration Surveys. Email correspondence with MNR employee May 2013.

Appendix B

Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario

Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario Canada

Prepared for

NextEra Energy Canada, ULC
390 Bay Street, Suite 1720
Toronto, ON M5H 2Y2

Prepared by

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November 22, 2013
(See end of document for revisions list)

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Introduction

The use of atmospheric variables to predict bat activity and mortality may have significant implications for informed operation minimization measures at wind energy facilities (WEFs). Bat activity is influenced by weather (i.e., wind speed, temperature, portion of moon illumination, and possibly others), and the influence of these varies by season and geographic region. (e.g., Baerwald and Barclay 2011; Weller and Baldwin 2012; Hooton et al. 2012). For example, bats are generally most active when wind speeds are low (< 6 m/s) and temperatures are higher (Arnett et al. 2008). However, it is important to consider other factors when trying to predict activity (Weller and Baldwin 2012). At a site in California, Weller and Baldwin (2012) found that the influence of these variables varied by season. Similarly, preliminary research indicates that the relationship between bats and weather is not constant across geographic regions; atmospheric conditions that would indicate high bat activity in one region may not predict bat activity in another (Hooton et al. 2012).

Bat and Bat Habitats: Guidelines for Wind Power Projects (*Guidelines*; Ontario MNR 2011) states that bat mortality is considered significant when annual bat mortality (averaged across the site) exceeds 10 bats/turbine/year. The annual mortality monitoring period spans from May 1 to October 31. However, bat mortality is concentrated in the fall months (July to September) and thus for all Phases this is the only time period that is considered.

The *Guidelines* further state that "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."

In addition, in January 2013 two species of bats were listed as Species at Risk (SAR) in Ontario; the little

brown bat (*Myotis lucifugus*) and the northern long-eared bat (*Myotis septentrionalis*). Therefore, NextEra Energy Canada (NEEC) is striving to avoid significant annual bat mortality at its Ontario WEFs by using the best available data on bat activity and mortality to predict conditions with potential high bat mortality while minimizing the operational impacts. Predicting risk to bats will enable operators such as NEEC to utilize "smart curtailment" and deploy operational mitigation selectively. This will result in an overall benefit to bats, including SAR-listed species.

The purpose of this study is to develop predictive bat activity and mortality models for southwestern Ontario based on atmospheric conditions. The focus of this study is the fall migratory period (July to October), which is when the highest concentration of bat mortality occurs (Arnett et al. 2008). It is possible that the predictive models developed by this project could be applied outside of the fall migratory period, which may provide benefits for bats that are resident in these areas in the summer (e.g., the *Myotis* species). These models will be used to predict broad-scale activity and mortality levels at projects throughout southwestern Ontario. The following proposal gives a detailed plan of how that will be accomplished. The results of the data collection, predictive model, and overall approach to operational mitigation will be discussed with the Technical Advisors, and will be approved by the MNR, prior to implementation.

Phase 1. Preliminary Analysis of Existing Fall Bat Activity Data - COMPLETED

The goal of Phase 1 is to leverage the existing fall bat activity data obtained from NEEC's Ontario WEFs to describe fall activity patterns to the extent possible given the data constraints. This information would provide an initial understanding of the relationships between bat activity and atmospheric/spatial patterns in relation to NEEC's Ontario WEFs. This information will be used with the other phases of work to understand how turbine operations can be managed between July 15 and October 31, 2013.

The ability of the information to inform management of turbine operations is dependent on the quality and quantity of the available data from the NEEC WEFs in Ontario. The data from the 2008 ReBATs (Figure 1) will be utilized for Phase 1, along with data from Golder Associates. Normandeau will review the data from Golder Associates and determine what can be used. All sound files received will be uploaded to the ReBAT.com web interface for viewing and storage. If the data is already analyzed to species, we will conduct a brief quality control analysis to ensure that the bat call identifications generally follow internal protocols. If the data is not analyzed to species, we will conduct the analysis on ReBAT.com. For all activity data sets, Normandeau will request the corresponding meteorological data from NEEC.

The bat acoustic monitoring that was conducted by Golder Associates took place in two areas proximal to the north shore of Lake Erie (Summerhaven [see Figure 1] and Nanticoke [not shown]). The previous acoustic monitoring conducted by Normandeau was along the southeast shore of Lake Huron within the Greenpower project area, which now consists of Jericho, Bornish, and Adelaide project areas (see Figure 1). The existing Normandeau data from the three met towers within the current project boundaries will provide information on general and species-specific bat activity levels and information specifically for the site. This will be invaluable when deciding where to locate the ReBAT systems for the mortality mitigation study. Data from the fourth Normandeau tower outside of existing project boundaries (east of the

Adelaide project boundary) will contribute to the understanding of spatial/temporal variation in bat activity. The data from the Summerhaven and Nanticoke projects will provide information on general and species-specific bat activity levels proximal to a large water body and will complement the Normandeau data for a more robust analysis of bat activity patterns.

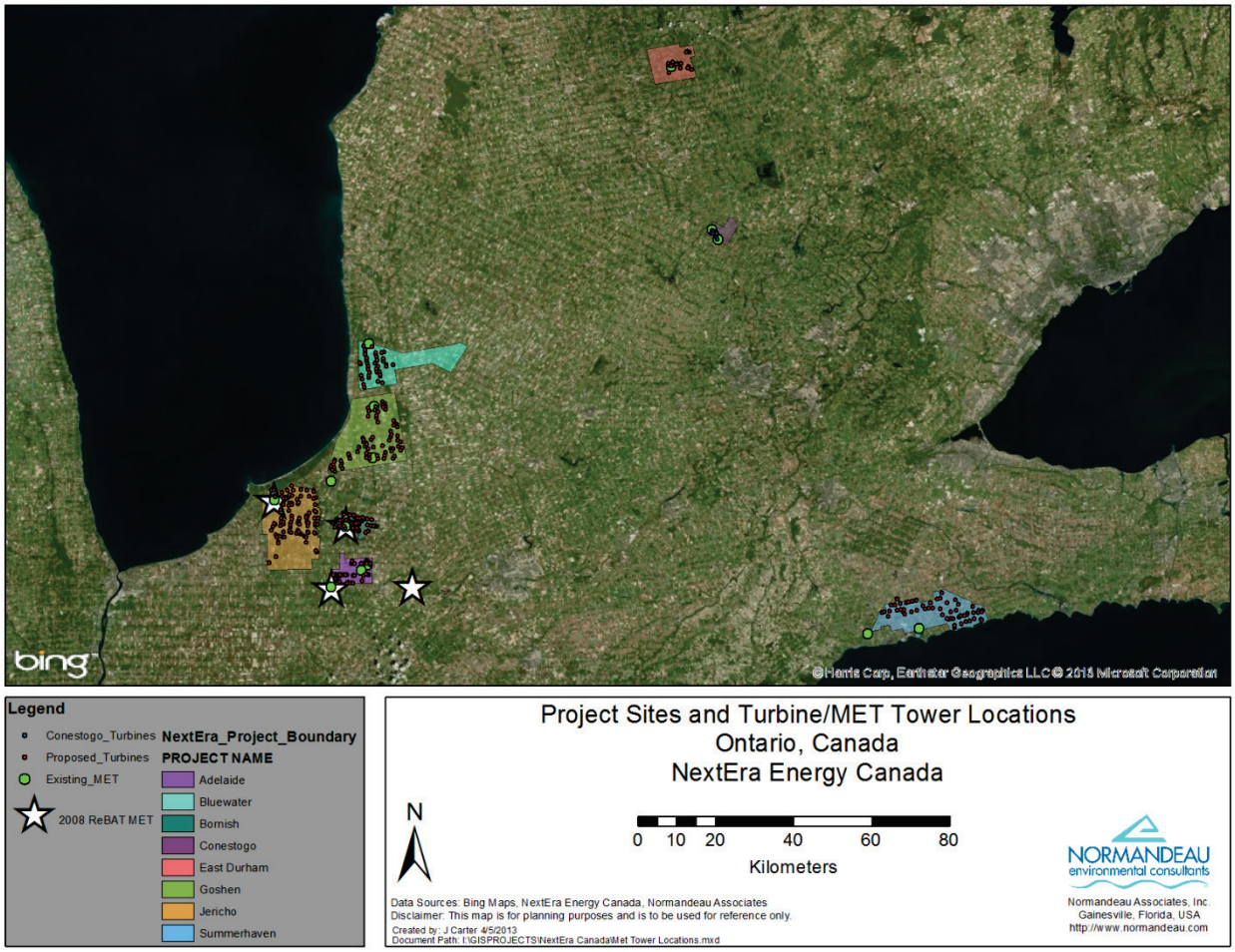

Figure 1. Location of existing NEEC meteorological towers, 2008 ReBAT systems, and the proposed and current NEEC turbines and WEFs in southwestern Ontario.

The activity and meteorological data will be assembled and investigated for patterns, trends, or other information that might be useful for determining turbine operational modifications to minimize bat mortality. Specifically, in Phase 1 we will:

- **Explore the relationships between bats and weather variables.** Although there are broad relationships between bats and weather (e.g., bats are most active at low wind speeds and mild temperatures), there may be region-specific patterns. By exploring these relationships in southern Ontario, we may be able to ascertain more specific values for when bats are most active in this area. We will look at temperature, wind speed, barometric pressure, precipitation, relative humidity, and wind direction, because these variables have been previously shown to influence bat activity. We will also explore other potential atmospheric variables to use.
- **Explore any spatial patterns of bat activity.** Bats can be highly influenced by landscape features and have been reported to follow coastlines, peninsulas, river valleys, and mountain ranges. In southwestern Ontario specifically, migrating bats tend to focus in areas along Lake Erie during migratory stopover. Considering the geography of the

proposed WEFs, bat activity may be highly concentrated in specific areas, particularly during migration. By determining where activity is concentrated—both at the site (Normandeau data) and within southern Ontario in general (Golder data and Normandeau data)—we can make an informed decision on where to deploy the ReBATs for the next phases of the study.

- **Determine locations of towers where ReBAT detectors should be deployed**. In order to develop the most robust predictive activity and mortality models possible, ReBATs need to be deployed where activity is likely to be highest. Using the information we gather from the spatial analysis of bat activity, we will be able to choose the best possible locations.

A predictive model will not be developed in Phase 1. The results of this data investigation will be provided to NEEC for use during the 2013 mortality monitoring season.

Phase 2. Fall Predictive Activity Modeling

The objective of Phase 2 is to develop a robust predictive model(s) of species-specific bat activity in the fall (July 15 to October 31) in Ontario.

This Phase will occur in 2 parts
2A. Preparations and Initial Monitoring
2B. Field Studies and Modeling

Phase 2A. Modeling Preparations and Initial Monitoring

The execution of the Activity modeling (Phase 2B) and the Mortality modeling (Phase 3) both require acoustic monitoring in order to provide a measure of bat activity at the site. Additionally, developing the Mortality modeling requires that mortality data is collected simultaneously with the acoustic activity data. This allows for correlation between bat activity and mortality.

In preparation for the activity and mortality modeling the following tasks need to be completed between Summer 2013 and Spring 2014:

- Prepare, test, and ship ReBATs to the project site
- Coordinate with Ontario MNR and other regulatory agencies
- Coordinate with Environment Canada and other potential partners
- Coordinate with contractor conducting the mortality studies
- Develop a field protocol for the mortality studies that provides the data needed for the modeling effort and is acceptable to all of the above parties

Additionally, preliminary acoustic monitoring will be completed in August-November 2013 at the Conestogo wind area. Four ReBAT systems (two detectors per system) will be installed on four turbines in August 2013. Acoustic monitoring will be concurrent with the mortality

monitoring that is already taking place at this site. This joint effort will provide a preliminary assessment of whether bat activity is correlated with bat mortality at Conestogo.

Phase 2B. Fall Predictive Activity Modeling - Field Studies and Modeling

Based on the modeling done for bat activity in the United States, a robust predictive model requires an estimated 5,000 detection events per species across multiple detector nights. In the United States, existing data suggests that in the fall, each ReBAT system (2 detectors per system) collects 15 calls per species per night for the most abundant species and about 4 calls per night for the less abundant species. Therefore, to build the Fall Predictive Activity Model it is estimated that data from 4 to 17 ReBAT systems would be needed. The ReBATs will be installed on NEEC met towers or turbines at the Ontario WEFs.

The statistical methods used in the modeling process are not yet finalized but are expected to consist mainly of generalized linear mixed models, which are a combination of two statistical frameworks and are robust at handling non-normal data, as well as data with random effects (Bolker et al. 2009). This allows us to control for any effects due to sampling design (e.g., multiple towers).

The predictive bat activity model will be developed using atmospheric variables. Previously, Normandeau used wind speed, temperature, relative humidity, and wind direction to develop predictive activity models for the U.S. Midwest and Southwest. These variables, as well as barometric pressure and precipitation, will be explored as potential variables in the predictive bat activity models for southwestern Ontario (data permitting). Additionally, we will investigate other potential atmospheric variables for inclusion in the models (e.g., moon percentage, visibility, and others).

Data permitting, we will develop 4 species-level models (eastern red bat, hoary bat, silver-haired bat, and tri-colored bat) and 1 genera-level model (*Myotis* spp., which includes the little brown bat, northern long-eared bat, and eastern small-footed bat). The little brown bat and the northern long-eared bat were recently added to the list of Species at Risk in Ontario as Endangered, and thus are high priority for mortality avoidance at WEFs. The *Myotis* species will be considered as a group for the following reasons:

- Small sample size: Myotis species are generally associated with cluttered, forested habitats (Norberg and Raynor 1987; van Zyll de Jong 1985), and acoustic monitoring at WEFs mostly takes place in open habitats (e.g., fields). Additionally, Myotis species emit high frequency, short duration echolocation calls, which attenuate quickly (Ratcliffe and Dawson 2003; Fenton and Bell 1979). This affects the quantity and quality of Myotis calls that we can record.
- Overlapping call characteristics: The three species of Myotis included in the Myotis group all have similar echolocation call structures (Ratcliffe and Dawson 2003; Fenton and Bell 1979), making it difficult to distinguish them acoustically.

The outcome of this phase will be 1 to 5 predictive activity models. These models will be expressed in such a form that NEEC will be able to input the necessary weather values and will get an estimate of bat activity. Although the models will only output a finite number of bat passes/night, these values should be considered as relative estimates of bat activity. NEEC can

use this information in conjunction with the mortality models (see Phase 3) to modify turbine operations to reduce potential bat mortality between July 15 and October 31 starting in 2014. These models can continue to be refined and updated as more data is collected over time.

Phase 3. Fall Predictive Mortality Modeling

The objective of Phase 3 is to develop a robust predictive model(s) of species- and/or genera-level bat mortality in the fall (July 15 to October 31) in Ontario. Using the same methods as described in Phase 2 (Activity models), we will (if data permits) develop 4 species-level models (eastern red bat, hoary bat, silver-haired bat, and tri-colored bat) and 1 genera-level model (*Myotis* spp., which includes the little brown bat, northern long-eared bat, and eastern small-footed bat). One of the reasons for developing both activity and mortality models is to be able to explore the relationship between bat activity and bat mortality and determine if this relationship can be described mathematically. It is assumed that higher activity will equate to higher mortality (e.g., Baerwald and Barclay 2011), but a direct comparison needs to be made. Since these mortality models will build off of the work done for the activity modeling, species for whom there is insufficient acoustic activity data to develop an activity model will not be eligible for developing a mortality model.

Bat carcass searches will be conducted at the turbines that will be simultaneously collecting bat acoustic data. Daily mortality searches are needed to provide tight time correlations between activity and mortality. If we know the specific night that bats died, we can know the exact weather conditions under which fatalities happened. The carcass search data needs to include location, date of detection, time, species, and preferably also sex and age. The sample size (number of bat carcasses) needed for a robust and precise model is unknown. However, given the number of variables we need to control for (at least 4 atmospheric variables, plus sex, age, and species) the sample size is expected to be large and will certainly exceed 300.

The outcome of this phase will be 1 to 5 predictive mortality models for the selected species for the fall. Although the mortality models will output a finite number of bat fatalities/night, these values should be considered as predictions of relative bat mortality. The models will be expressed in such a form that NEEC use the information to modify turbine operations to reduce potential bat mortality, starting in Fall 2015. These models can continue to be refined and updated as more data is collected over time.

Phase 4. Evaluation

Based on Phase 2 and Phase 3, we will pick an optimal set of models (activity or mortality) for each species that will be used to inform operational minimization. Phase 4 will involve the implementation and evaluation of the effectiveness of these models.

Model evaluation (i.e., validation) assesses how closely the model predictions conform to empirical observations. It is a critical step in the modeling process to determine not only the magnitude of performance of the model, but also how the model performs at a range of input values. In Phase 4, evaluation will be performed to determine how well the model predicts

activity and/or mortality during the fall (July 15 to October 31). Comparisons between observed and predicted bat activity and/or mortality values will be done using simple linear regression. Other evaluations of model performance may be conducted, but the specific approach will depend on the structure of the data itself. We will conduct an evaluation for each model (per species).

The major steps for evaluating effectiveness are:

- Implement fall model(s) at wind facilities
- Collect fall activity and mortality data
- Analyze fall data to determine effectiveness in keeping mortality below the 10 bats/turbine/year threshold (Ontario MNR 2011)
- Report results of model(s) evaluation per species
- Revise fall model(s) if needed

The outcome of Phase 4 will be a report on the effectiveness of the model(s) to reduce or maintain mortality below the 10 bats/turbine/year threshold.

If using the mortality and/or activity models to inform operational minimization measures successfully reduces the number of fatalities, NEEC will be able to continue to implement these models at all sites in southern Ontario in order to stay under the Ontario MNR (2011) bat fatality threshold. If the models are unsuccessful at predicting bat mortality, they can be revised via the iterative integration of new data. Additionally, given enough data, the models could be refined from broad-scale predictive models to fine-scale predictive models.

Project Schedule

	Phase and Task	Spring 2013	Summer 2013	Fall 2013	Winter 2013-14	Spring 2014	Summer 2014	Fall 2014	Winter 2014-15	Spring 2015	Summer 2015	Fall 2015	Winter 2015-16	Spring 2016
	Phase 1. Preliminary Analysis Of Existing Fall Bat Activity Data - COMPLETED													
1	Assemble existing fall activity data and conduct a preliminary analysis	X	X											
2	Provide the results of the preliminary activity analysis (based on existing data) to NEEC.			X										
	Phase 2. Fall Predictive Activity Modeling													
3	Prepare and ship ReBATS		X											
4	Coordination with agencies and others. Protocol development		X	X	X	X								
5	Collect new fall activity data using ReBAT systems						X	X						
6	Analyze fall activity data						X	X	X					
	Develop fall predictive activity model, incorporating new activity data							X	X	X				
	Provide the fall predictive activity model to NEEC for implementation										X			
	Phase 3. Fall Predictive Mortality Modeling													
7	Other consultants collecting fall mortality data (Pending approach)						X	X						
8	Develop fall predictive mortality model							X	X	X				
9	Provide the fall predictive mortality model to NEEC for implementation										X			
	Phase 4. Evaluation													
10	Implement fall mortality model at NEEC WEFs										X	X		
11	Collect fall activity and mortality data										X	X		
12	Analyze fall activity and mortality data to determine effectiveness of mortality model											X	X	
13	Revise fall mortality model if needed												X	X
14	Provide revised fall mortality model to NEEC													X

References

Arnett, E. B., W. K. Brown, W. P. Erickson, J. K. Fielder, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. J. O'Connell, M. D. Piorkowski, and R. D. Tankersley, Jr. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72(1):61–78.

Baerwald, E. F., and R. M. R. Barclay. 2011. Patterns of activity and fatality of migratory bats at a wind energy facility in Alberta, Canada. Journal of Wildlife Management 75(5):1103–1114.

Bolker, B. M., M. E. Brooks, C. J. Clark, S. W. Geange, J. R. Poulsen, M. H. H. Stevens, and J. S. S. White. 2009. Generalized linear mixed models: A practical guide for ecology and evolution. Trends in Ecology and Evolution 24(3): 127-135.

Fenton, M. B., G. P. and Bell. 1979. Echolocation and feeding behavior in four species of *Myotis* (Chiroptera). Canadian Journal of Zoology 57:1271–1277.

Hooton, L. A., C. Sutter, A. Costello, and G. Forcey. 2012. The influence of specific atmospheric variables on fall bat activity varies among geographic regions and species. Wind Wildlife Research Meeting IX; Denver, Colorado.

Norberg, U. M., and J. M. V. Rayner. 1987. Ecological morphology and flight in bats (Mammalia; Chiroptera): Wing adaptations, flight performance, foraging strategy and echolocation. Philosophical Transactions of the Royal Society of London, Series B 316:335–427.

Ontario Ministry of Natural Resources. 2011. Bat and Bat Habitats: Guidelines for Wind Power Projects. Second Edition. July 2011. MNR Number 52696 (English). Available from: http://www.mnr.gov.on.ca

Ratcliffe, J. M., J. W. and Dawson. 2003. Behavioural flexibility: The little brown bat, *Myotis lucifugus*, and the northern long-eared bat, *M. septentrionalis*, both glean and hawk prey. Animal Behaviour 66:847-856.

Weller, T. J., and J. A. Baldwin. 2012. Using echolocation monitoring to model bat occupancy and inform mitigations at wind energy facilities. Journal of Wildlife Management. 76(3):619-631.

van Zyll de Jong, C. G. 1985. Handbook of Canadian mammals. Vol. 2 (Bats). Ottawa: National Museums of Natural Sciences.

Revisions

Revision	Date	Details
Revision 1	4/1/2013	Added landscape analysis to scope per input from MNR and NGO partners
Revision 2	8/21/2013	Added language to describe the Conestogo study
Revision 3	11/18/2013	Added language supplied by MNR regarding technical advisors and making the results publicly available
Revision 4	11/22/2013	More clearly defined model applicability to SAR, per MNR input during 11/20/2013 meeting in Peterborough.

Western Science

Department of Biology

12 November 2013

NextEra Energy Canada
390 Bay Street, Suite 1720
Toronto, Ontario M5H 2Y2

Dear Colleagues:

I was pleased to be involved as a technical advisor on this project. It is a relief to see that people involved in the renewable energy sector are sensitive to concerns about the impact of their operations on wildlife. In this case, the focus is the impact of wind turbines on bats. Recently I have been involved in this situation directly (trying to assess the relationship between bat activity and their vulnerability to turbines) and less directly (testifying before a Tribunal).

The active involvement of private sector players such as NexEra Energy Canada in the process of reducing the mortality of bats at turbines is very important. Without this involvement, we are unlikely to see any positive change in the situation, other than the one reflecting fewer bats to collide with more turbines.

I fully support the NextEra Canada endeavour.

Sincerely

M.B. Fenton, Ph.D.
Emeritus Professor

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Department of Biology • Biological & Geological Sciences Building • London, Ontario • CANADA • N6A 5B7
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Appendix C
Summerhaven Wind Energy Centre REA Approval Letter

Ontario

Ministry of the Environment
Ministère de l'Environnement

RENEWABLE ENERGY APPROVAL

NUMBER 2484-8RQUS4
Issue Date: March 16, 2012

Summerhaven Wind, LP
5500 North Service Rd, No. Suite 205
Burlington, Ontario
L7L 6W6

Project Location: Concession Road 5
Lot 19-20, Concession 5
Haldimand County,
N0A 1J0

You have applied in accordance with Section 47.4 of the Environmental Protection Act for approval to engage in a renewable energy project in respect of a Class 4 Wind facility consisting of the following:

- the construction, installation, operation, use and retiring of:

(a) fifty-eight (58) wind turbine generators, each rated at 2.221 megawatts generating output capacity with a total name plate capacity of 128.82 megawatts, designated as sources ID Nos. WTG-001, WTG-003 to WTG-028, WTG-30 to WTG-59, and WTG-61, each with a hub height of 80 metres above grade, and sited at the locations shown in Schedule A and as indicated in the supporting documentation submitted with the application;

(b) one (1) transformer substation, rated at 140 megavolt-ampere, 34.5/241.5 kilovolts, with a total sound power level rating including cooling fans not exceeding 88 dBA, and sited at the location shown in Schedule A and as indicated in the supporting documentation submitted with the application; and

(c) associated ancillary equipment, systems and technologies including on-site access roads, underground cabling and overhead distribution and transmission lines;

all in accordance with the application for a Renewable Energy Approval dated June 09, 2011, and signed by F. Allen Wiley, Vice President of Development, Summerhaven Wind LP, and all supporting documentation submitted with the application, including amended documentation submitted up to March 07, 2012.

For the purpose of this renewable energy approval, the following definitions apply:

1. "Acoustic Assessment Report" means the report included in the Application and entitled NextEra Energy Canada ULC Summerhaven Wind Energy Centre Application for a Renewable Energy Approval Noise Study Report, dated August 2011, prepared by Golder Associates and signed by Samuel Isono, Acoustics, Noise and Vibration Engineer, Golder Associates, and includes additional correspondence submitted up to March 7, 2012;

2. "Acoustic Audit - Emission" means an investigative procedure that is compliant with the IEC Standard 61400-11 and consisting of measurements and/or acoustic modelling of noise emissions produced by wind turbine generators, assessed to determine compliance with the manufacturer's noise (acoustic) equipment specifications and emission data of the wind turbine generators, included in the Acoustic Assessment Report;

3. "Acoustic Audit - Immission" means an investigative procedure consisting of measurements and/or acoustic modelling of all sources of noise emissions due to the operation of the Equipment, assessed to determine compliance with the Noise Performance Limits set out in this Approval;

4. "Acoustic Audit Report - Emission" means a report presenting the results of the Acoustic Audit - Emission;

5. "Acoustic Audit Report - Immission" means a report presenting the results of the Acoustic Audit - Immission;

6. "Acoustical Consultant" means a person currently active in the field of environmental acoustics and noise/vibration control, who is knowledgeable about Ministry noise guidelines and procedures and has a combination of formal university education, training and experience necessary to assess noise emissions from wind facilities;

7. "Act" means the *Environmental Protection Act* , R.S.O 1990, c.E.19, as amended;

8. "Adverse Effect" has the same meaning as in the Act;

9. "Application" means the application for a Renewable Energy Approval dated June 9, 2011, and signed by F. Allen Wiley, Vice President of Development, Summerhaven Wind LP, and all supporting documentation submitted with the application, including amended documentation submitted up to March 7, 2012;

10. "Approval" means this Renewable Energy Approval issued in accordance with Section 47.4 of the Act, including any schedules to it;

11. "A-weighting" means the frequency weighting characteristic as specified in the International Electrotechnical Commission (IEC) Standard 61672, and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound . It is denoted as "A";

12. "A-weighted Sound Pressure Level" means the Sound Pressure Level modified by application of an A-weighting network. It is measured in decibels, A-weighted, and denoted "dBA";

13. "Class 1 Area" means an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum;"

14. "Class 2 Area" means an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 Areas:

    (a) sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours);

    (b) low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours);

    (c) no clearly audible sound from Stationary Sources other than from those under impact assessment.

15. "Class 3 Area" means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as the following:

    (a) a small community with less than 1000 population;

    (b) agricultural area;

    (c) a rural recreational area such as a cottage or a resort area; or

    (d) a wilderness area.

16. "Company" means Strathroy Wind GP Inc., as general partner for Summerhaven Wind LP, solely in connection with the conduct of business of that Limited Partnership, and includes its successors and assignees;

17. "Compliance Protocol for Wind Turbine Noise" means the Ministry document entitled, Compliance Protocol for Wind Turbine Noise, Guideline for Acoustic Assessment and Measurement, PIBS 8540e;

18. "Decibel" means a dimensionless measure of Sound Level or Sound Pressure Level, denoted as dB;

19. "Director" means a person appointed in writing by the Minister of the Environment pursuant to section 5 of the Act as a Director for the purposes of section 47.5 of the Act;

20. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Facility is geographically located;

21. "Equipment" means the fifty-eight (58) wind turbine generators, and one (1) transformer substation, identified in this Approval and as further described in the Application, to the extent approved by this Approval;

22. "Equivalent Sound Level" is the value of the constant sound level which would result in exposure to the same total A-weighted energy as would the specified time-varying sound, if the constant sound level persisted over an equal time interval. It is denoted Leq and is measured in dB A-weighting (dBA);

23. "Facility" means the renewable energy generation facility, including the Equipment, as described in this Approval and as further described in the Application, to the extent approved by this Approval;

24. "IEC Standard 61400-11" means the International Standard IEC Standard 61400-11, Wind turbine generator systems – Part 11: Acoustic noise measurement techniques, 2006;

25. "Independent Acoustical Consultant" means an Acoustical Consultant who is not representing the Company and was not involved in preparing the Acoustic Assessment Report. The Independent Acoustical Consultant shall not be retained by the Acoustical Consultant involved in the noise impact assessment;

26. "Ministry" means the ministry of the government of Ontario responsible for the Act and includes all officials, employees or other persons acting on its behalf;

27. "Noise Guidelines for Wind Farms" means the Ministry document entitled, Noise Guidelines for Wind Farms - Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities, dated October 2008;

28. "Noise Receptor" has the same meaning as in O. Reg. 359/09;

29. "O. Reg. 359/09" means Ontario Regulation 359/09 "Renewable Energy Approvals under Part V.0.1 of the Act" made under the Act;

30. "Point of Reception" has the same meaning as in the Noise Guidelines for Wind Farms and is subject to the same qualifications described in that document;

31. "Sound Level" means the A-weighted Sound Pressure Level;

32. "Sound Level Limit" is the limiting value described in terms of the one hour A-weighted Equivalent Sound Level Leq;

33. "Sound Pressure" means the instantaneous difference between the actual pressure and the average or barometric pressure at a given location. The unit of measurement is the micro pascal (μPa);

34. "Sound Pressure Level" means twenty times the logarithm to the base 10 of the ratio of the effective pressure (μPa) of a sound to the reference pressure of 20 μPa;

35. "UTM" means Universal Transverse Mercator coordinate system.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

A - GENERAL

A1. The Company shall construct, install, use, operate, maintain and retire the Facility in accordance with the terms and conditions of this Approval and the Application.

A2. Where there is a conflict between a provision of this Approval and any document submitted by the Company, the conditions in this Approval shall take precedence. Where there is a conflict between one or more of the documents submitted by the Company, the document bearing the most recent date shall take precedence.

A3. The Company shall ensure a copy of this Approval is:

(1) accessible, at all times, by Company staff operating the Facility and;

(2) submitted to the clerk of each local municipality and upper-tier municipality in which the Facility is situated.

A4. If the Company has a publicly accessible website, the Company shall ensure that the Approval and the Application are posted on the Company's website within five (5) business days of receiving this Approval.

A5. The Company shall, at least six (6) months prior to the anticipated retirement date of the entire Facility, or part of the Facility, review its Decommissioning Plan Report to ensure that it is still accurate. If the Company determines that the Facility cannot be decommissioned in accordance with the Decommissioning Plan Report, the Company shall provide the Director and District Manager a written description of plans for the decommissioning of the Facility.

A6. The Facility shall be retired in accordance with the Decommissioning Plan Report and any directions provided by the Director or District Manager.

A7. The Company shall provide the District Manager and the Director at least ten (10) days written notice of the following:

(1) the commencement of any construction or installation activities at the project location; and,

(2) the commencement of the operation of the Facility.

A8. No construction or installation activities shall be commenced at the project location unless the Company has received any required authorizations under the *Endangered Species Act, 2007.*

B - EXPIRY OF APPROVAL

B1. Construction and installation of the Facility must be completed within three (3) years of the later of:

(1) the date this Approval is issued; or

(2) if there is a hearing or other litigation in respect of the issuance of this Approval, the date that this hearing or litigation is disposed of, including all appeals.

B2. This Approval ceases to apply in respect of any portion of the Facility not constructed or installed before the later of the dates identified in Condition No. B1.

C - NOISE PERFORMANCE LIMITS

C1. The Company shall ensure that:

(1) the Sound Levels from the Equipment, at the Points of Reception identified in the Acoustic Assessment Report, comply with the Sound Level Limits set in the Noise Guidelines for Wind Farms, as applicable, and specifically as stated in the table below:

Wind Speed (m/s) at 10 m height	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sound Level Limits, dBA	40.0	40.0	40.0	43.0	45.0	49.0	51.0

(2) the Equipment is constructed and installed at either of the following locations:

a) at the locations identified in Schedule A of this Approval; or

b) at a location that does not vary by more than 10 metres from the locations identified in Schedule A of this Approval and provided that,

i) the Equipment will comply with Condition No. C1 (1); and

ii) all setback prohibitions established under O.Reg. 359/09 are complied with.

C2. If the Company determines that some or all of the Equipment cannot be constructed in accordance with Condition No. C1 (2), prior to the construction and installation of the Equipment in question, the Company shall apply to the Director for an amendment to the terms and conditions of the Approval.

C3. Within three (3) months of the completion of the construction of the Facility, the Company shall submit to the Director a written confirmation signed by an individual who has the authority to bind the Company that the UTM coordinates of the "as constructed" Equipment comply with the requirements of Condition No. C1 (2).

C4. The locations identified in Table 5 of the Acoustic Assessment Report as "Receptor ID" numbers VPOR0001 to VPOR0231 are specified as Noise Receptors for the purposes of paragraph 2 of subsection 54 (1.1) of O. Reg. 359/09 and subclause 35 (1) (a) (ii) of O. Reg. 359/09.

D - ACOUSTIC AUDIT - IMMISSION

D1. The Company shall carry out an Acoustic Audit - Immission of the Sound Levels produced by the operation of the Equipment in accordance with the following:

(1) the acoustic audit measurements shall be undertaken in accordance with Part D of the Compliance Protocol for Wind Turbine Noise;

(2) the acoustic audit measurements shall be performed by an Independent Acoustical Consultant at three (3) different Points of Reception that have been selected using the following criteria:

(a) the Points of Reception should represent the location of the greatest predicted noise impact, i.e. the highest predicted Sound Level; and

(b) the Points of Reception should be located in the direction of prevailing winds from the Facility;

(3) the acoustic audit measurements shall be performed on two (2) separate occasions within a period of twelve (12) months that represent the lowest annual ambient Sound Levels, preferably:

(a) March and April, and

(b) October and November

D2. The Company shall submit to the District Manager and the Director an Acoustic Audit Report-Immision, prepared by an Independent Acoustical Consultant, at the following points in time:

(1) no later than six (6) months after the commencement of the operation of the Facility for the first of the two (2) acoustic audit measurements at the three (3) Points of Reception; and

(2) no later than twelve (12) months after the commencement of the operation of the Facility for the second of the two (2) acoustic audit measurements at the three (3) Points of Reception.

E - ACOUSTIC AUDIT - EMISSION

E1. The Company shall carry out an Acoustic Audit - Emission of the acoustic emissions produced by the operation of the wind turbine generators in accordance with the following:

(1) the acoustic emission measurements shall be undertaken in accordance with the IEC Standard 61400-11;

(2) the acoustic emission measurements shall be performed by an Independent Acoustical Consultant; and

(3) the acoustic emission measurements shall be performed on any one of the wind turbine generators rated at 2.221 megawatts generating output capacity used in the Facility.

E2. The Company shall submit to the District Manager and the Director an Acoustic Audit Report-Emission, prepared in accordance with Section 9 of the IEC Standard 61400-11 by an Independent Acoustical Consultant, no later than six (6) months after the commencement of the operation of the Facility.

F - STORMWATER MANAGEMENT

F1. The Company shall employ best management practices for stormwater management and sediment and erosion control during construction, installation, use, operation, maintenance and retiring of the Facility, as outlined in the Application.

G - SEWAGE WORKS OF THE TRANSFORMER SUBSTATION SPILL CONTAINMENT FACILITY

G1. The Company shall design and construct a transformer substation spill containment facility which meets the following requirements:

(1) the spill containment area serving the transformer shall have a minimum volume equal to the volume of transformer oil and lubricants plus the volume equivalent to providing a minimum 24-hour duration, 25-year return storm capacity for the stormwater drainage area around the transformer under normal operating conditions;

(2) the containment facility shall have an impervious concrete floor and walls sloped toward an outlet, maintaining a freeboard of 0.25 metres terminating approximately 0.30 metres above grade, with an impervious plastic liner or equivalent, and 1.0 metre layer of crushed stoned within;

(3) the containment pad shall drain to an oil control device, such as an oil/water separator, a pump-out sump, an oil absorbing material in a canister or a blind sump; and

(4) the oil control device shall be equipped with an oil detection system and appropriate sewage appurtenances as necessary (pumpout manhole, submersible pumps, level controllers, floating oil sensors, etc.) that allows for batch discharges or direct discharges and for proper implementation of the monitoring program described in Condition No. G4.

G2. The Company shall:

(1) as a minimum, check the oil detection system on a monthly basis and create a written record of the inspections;

(2) ensure that the effluent is essentially free of floating and settle-able solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen or foam on the receiving waters;

(3) immediately identify and clean-up all losses of oil from the transformer;

(4) upon identification of oil in the effluent pumpout, take immediate action to prevent the further occurrence of such loss; and

(5) ensure that equipment and material for the containment, clean-up and disposal of oil and materials contaminated with oil are kept within easy access and in good repair for immediate use in the event of:

(a) loss of oil from the transformer,
(b) a spill within the meaning of Part X of the Act, or
(c) the identification of an abnormal amount of oil in the effluent.

G3. The Company shall use best efforts to design, construct and operate the sewage works such that the concentration of the effluent parameter named in the table below does not exceed the maximum concentration objective shown for that parameter in the effluent, and shall comply with the following requirements:

Effluent Parameters	Maximum Concentration Objective
Oil and Grease	15mg/L

(1) notify the District Manager as soon as reasonably possible of any exceedance of the maximum concentration objective set out in the table above;

(2) take immediate action to identify the cause of the exceedance; and

(3) take immediate action to prevent further exceedances.

G4. Upon commencement of the operation of the Facility, the Company shall establish and carry out the following monitoring program for the sewage works:

(1) the Company shall collect and analyse the required set of samples at the sampling points listed in the table below in accordance with the measurement frequency and sample type specified for the effluent parameter, oil and grease, and create a written record of the monitoring:

Effluent Parameters	Measurement Frequency and Sample Points	Sample Type
Oil and Grease	B – Batch, i.e., for each discrete volume in the sump	Grab

	prior to pumpout; or Q – Quarterly for direct effluent discharge, i.e., four times over a year, relatively evenly spaced.	

(2) in the event of an exceedance of the maximum concentration objective set out in the table in Condition No. G3, the Company shall:

(a) increase the frequency of sampling to once per month, for each month that effluent discharge occurs, and

(b) provide the District Manager, on a monthly basis, with copies of the written record created for the monitoring until the District Manager provides written direction that monthly sampling and reporting is no longer required; and

(3) if over a period of twenty-four (24) months of effluent monitoring under Condition No. G4(1), there are no exceedances of the maximum concentration set out in the table in Condition No. G3, the Company may reduce the measurement frequency of effluent monitoring to a frequency as the District Manager may specify in writing, provided that the new specified frequency is never less than annual.

G5. The Company shall comply with the following methods and protocols for any sampling, analysis and recording undertaken in accordance with Condition No. G4:

(1) Ministry of the Environment publication "Protocol for the Sampling and Analysis of Industrial/ Municipal Wastewater," January 1999, as amended from time to time by more recently published editions, and

(2) the publication "Standard Methods for the Examination of Water and Wastewater", 21st edition, 2005, as amended from time to time by more recently published editions.

H - WATER TAKING ACTIVITIES

H1. For foundation dewatering, if the amount of discharge exceeds 50,000 litres per day:

(1) the inlet pump head shall be surrounded with clear stone and filter fabric;

(2) the discharge must be sampled each day that water is discharged and analyzed for total suspended solids (TSS). In the event that sampling results show that TSS in the discharge water exceeds 25 mg/L, the Company shall implement appropriate measures (settling tank or geosock or similar device) to mitigate these impacts; and,

(3) the Company shall regulate the discharge at such a rate that there is no flooding in the receiving water body or dissipate the discharge so that no soil erosion is caused that impacts the receiving water body.

H2. For stream diversion, if the amount of discharge exceeds 50,000 litres per day and dam and pump technology is used:

(1) the Company shall regulate the discharge at such a rate that there is no flooding in the downstream area and no soil erosion or stream channel scouring caused at the point of discharge. The Company shall use a discharge diffuser or other energy dissipation device, if necessary, to mitigate flows which physically alter the stream channel or banks; and,

(2) siltation control measures shall be installed at both the taking location upstream of the construction site and (if necessary) the discharge site and shall be sufficient for the volumes pumped. The Company shall take all measures to properly maintain these control devices throughout the construction period.

H3. For water takings (by tanker) for the purposes of dust suppression, equipment washing, and similar activities:

(1) notwithstanding the authorized rate of water taking, this Approval limits the taking of water at any site at the project location for up to 10% of the instantaneous streamflow present on the day or days of taking. The authorized water taking rate may therefore have to be adjusted downward to remain within this 10% maximum;

(2) prior to taking water from any site at the project location, the Company shall contact the Long Point Region Conservation Authority to determine if any low water conditions have been declared and are in effect. The Company shall not take water if a Level 2 or Level 3 low water condition has been declared; and,

(3) no modification to the existing stream channel by excavation or damming is permitted under this Approval.

I - BIRD AND BAT MONITORING

I1. The Company shall implement its Post Construction Follow-up Plan submitted as part of the Application.

I2. If the Company determines that it must deviate from its Post Construction Follow-up Plan, the Company shall contact the District Manager at the Guelph District Office of the Ministry of Natural Resources and the Director, prior to making any changes to the methodology in the Post Construction Follow-up Plan, and follow any directions provided.

I3. The Company shall contact the District Manager at the Guelph District Office of the Ministry of Natural Resources and the Director if the mortality thresholds stated in its Post Construction Follow-up Plan are reached for either bird or bats.

J - TRAFFIC MANAGEMENT PLANNING

J1. Within three (3) months of receiving this Approval, the Company shall prepare a Traffic Management Plan and provide it to Haldimand County.

J2. Within three (3) months of having provided the Traffic Management Plan to Haldimand County, the Company shall make reasonable efforts to enter into a Road Users Agreement with Haldimand County.

J4. If a Road Users Agreement has not been signed with Haldimand County within three (3) months of having provided the Traffic Management Plan to Haldimand County, the Company shall provide a written explanation to the Director as to why this has not occurred.

K - ARCHAEOLOGICAL RESOURCES

K1. The Company shall implement all of the recommendations, if any, for further archaeological fieldwork and for the protection of archaeological sites found in the consultant archaeologist's report included in the Application, and which the Company submitted to the Ministry of Tourism and Culture in order to comply with clause 22 (2) (b) of O. Reg. 359/09.

K2. Should any previously undocumented archaeological resources be discovered, the Company shall:

(1) cease all alteration of the area in which the resources were discovered immediately;

(2) engage a consultant archaeologist to carry out the archaeological fieldwork necessary to further assess the area and to either protect and avoid or excavate any sites in the area in accordance with the *Ontario Heritage Act,* the regulations under that act and the Ministry of Tourism and Culture's *Standards and Guidelines for Consultant Archaeologists;* and

(3) notify the Director as soon as reasonably possible.

L - COMMUNITY LIAISON COMMITTEE

L1. Within three (3) months of receiving this Approval, the Company shall make reasonable efforts to establish a Community Liaison Committee. The Community Liaison Committee shall be a forum to exchange ideas and share concerns with interested residents and members of the public. The Community Liaison Committee shall be established by:

(1) publishing a notice in a newspaper with general circulation in each local municipality in which the project location is situated; and

(2) posting a notice on the Company's publicly accessible website, if the Company has a website;

to notify members of the public about the proposal for a Community Liaison Committee and invite residents living within a one (1) kilometre radius of the Facility that may have an interest in the Facility to participate on the Community Liaison Committee.

L2. The Company may invite other members of stakeholders to participate in the Community Liaison Committee, including, but not limited to, local municipalities, local conservation authorities, Aboriginal communities, federal or provincial agencies, and local community groups.

L3. The Community Liaison Committee shall consist of at least one Company representative who shall attend all meetings.

L4. The purpose of the Community Liaison Committee shall be to:

(1) act as a liaison facilitating two way communications between the Company and members of the public with respect to issues relating to the construction, installation, use, operation, maintenance and retirement of the Facility;

(2) provide a forum for the Company to provide regular updates on, and to discuss issues or concerns relating to, the construction, installation, use, operation, maintenance and retirement of the Facility with members of the public; and

(3) ensure that any issues or concerns resulting from the construction, installation, use, operation, maintenance and retirement of the Facility are discussed and communicated to the Company.

L5. The Community Liaison Committee shall be deemed to be established on the day the Director is provided with written notice from the Company that representative Community Liaison Committee members have been chosen and a date for a first Community Liaison Committee meeting has been set.

L6. If a Community Liaison Committee has not been established within three (3) months of receiving this Approval, the Company shall provide a written explanation to the Director as to why this has not occurred.

L7. The Company shall ensure that the Community Liaison Committee operates for a minimum period of two (2) years from the day it is established. During this two (2) year period, the Company shall ensure that the Community Liaison Committee meets a minimum of two (2) times per year. At the end of this two (2) year period, the Company shall contact the Director to discuss the continued operation of the Community Liaison Committee.

L8. The Company shall ensure that all Community Liaison Committee meetings are open to the general public.

L9. The Company shall provide administrative support for the Community Liaison Committee including, at a minimum:

(1) providing a meeting space for Community Liaison Committee meetings; and

(2) providing access to resources, such as a photocopier, stationary, and office supplies, so that the Community Liaison Committee can:

(a) prepare and distribute meeting notices;

(b) record and distribute minutes of each meeting; and

(c) prepare reports about the Community Liaison Committee's activities.

L10. The Company shall submit any reports of the Community Liaison Committee to the Director and post it on the Company's publicly accessible website, if the Company has a website.

M - OPERATION AND MAINTENANCE

M1. Prior to the commencement of the operation of the Facility, the Company shall prepare a written manual for use by Company staff outlining the operating procedures and a maintenance program for the Equipment. including the sewage works of the transformer substation spill containment facility, that includes as a minimum the following:

(1) routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the Equipment suppliers;

(2) inspection programs including frequency of inspection and the methods or tests employed to detect when maintenance is necessary;

(3) repair and maintenance programs, including the frequency of repair and maintenance;

(4) emergency procedures;

(5) procedures for any record keeping activities relating to operation and maintenance of the Equipment, including the sewage works of the transformer spill containment facility;

(6) all appropriate measures to minimize noise emissions from the Equipment; and

(7) any additional information requested in writing by the District Manager from time to time.

M2. The Company shall;

(1) update as required the manual described in Condition No. M1; and

(2) make the manual described in Condition No. M1 available for review by the Ministry upon request.

M3. The Company shall ensure that the Facility is operated and maintained in accordance with the Approval and the manual described in Condition No. M1.

N - RECORD CREATION AND RETENTION

N1. The Company shall create written records consisting of the following:

(1) an operations log summarizing the operation and maintenance activities of the Facility;

(2) within the operations log, a summary of routine and Ministry staff inspections of the Facility; and

(3) a record of any complaint alleging an Adverse Effect caused by the construction, installation, use, operation, maintenance or retirement of the Facility.

N2. A record described under Condition No. N1(3) shall include:

(1) a description of the complaint that includes as a minimum the following:

a) the date and time the complaint was made;

b) the name, address and contact information of the person who submitted the complaint;

(2) a description of each incident to which the complaint relates that includes as a minimum the following:

a) the date and time of each incident;

b) the duration of each incident;

c) the wind direction and wind speed at the time of each incident;

d) the ID of the Equipment involved in each incident and its output at the time of each incident;

e) the location of the person who submitted the complaint at the time of each incident; and

(3) a description of the measures taken to address the cause of each incident to which the complaint relates and to prevent a similar occurrence in the future.

N3. The Company shall retain, for a minimum of five (5) years from the date of their creation, all records described in Condition No. N1 and N2, and make these records available for review by the Ministry upon request.

O - NOTIFICATION OF COMPLAINTS

O1. The Company shall notify the District Manager of each complaint within two (2) business days of the receipt of the complaint.

O2. The Company shall provide the District Manager with the written records created under Condition No. N2 within eight (8) business days of the receipt of the complaint.

P - ABORIGINAL CONSULTATION

P1. The Company shall maintain ongoing communications with interested Aboriginal communities during the construction, installation, and operation of the Facility.

P2. The Company shall fulfil all commitments made to Aboriginal communities during the construction, installation, and operation of the Facility, including but not limited to, providing the following to interested Aboriginal communities that have requested or may request it:

(1) updated project information, including the results of monitoring activities undertaken and copies of additional archaeological assessment reports that may be prepared; and;

(2) updates on key steps in the construction, installation, and operation phases of the Facility, including notice of the commencement of construction activities at the project location.

P3. If an interested Aboriginal community requests a meeting to obtain information relating to the construction, installation, and operation of the Facility, the Company shall use best efforts to arrange and participate in such a meeting.

P4 If any archaeological resources of Aboriginal origin are found during the construction of the Facility, the Company shall:

(1) notify the Six Nations of the Grand River and the Mississaugas of the New Credit and any other Aboriginal community considered likely to be interested or which has expressed an interest in such finds; and,

(2) arrange and participate in any meeting requested by an interested Aboriginal community to discuss the archaeological find(s) and/or the use of Aboriginal archaeological liaisons.

P5 The Company shall coordinate with the Six Nations of the Grand River consultation team to assess anecdotal information that the team has gathered from Six Nations harvesters about any changes in deer behaviour during the construction, installation and operation of the Facility.

Q - CHANGE OF OWNERSHIP

Q1. The Company shall notify the Director in writing, and forward a copy of the notification to the District Manager, within thirty (30) days of the occurrence of any of the following changes:

(1) the ownership of the Facility;

(2) the operator of the Facility;

(3) the address of the Company;

(4) the partners, where the Company is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B.17, as amended, shall be included in the notification; and

(5) the name of the corporation where the Company is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C.39, as amended, shall be included in the notification.

The reasons for the imposition of these terms and conditions are as follows:

REASONS

1. Condition Nos. A1 and A2 are imposed to ensure that the Facility is constructed, installed, used, operated, maintained and retired in the manner in which it was described for review and upon which Approval was granted. These conditions are also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition Nos. A3 and A4 are included to require the Company to provide information to the public and the local municipality.

3. Condition Nos. A5 and A6 are included to ensure that final retirement of the Facility is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure long-term protection of the health and safety of the public and the environment.

4. Conditions No. A7 is included to require the Company to provide information to the district Ministry of the Environment.

5. Condition No. A8 is included to ensure that the Company has the necessary permits under the *Endangered Species Act* prior to the commencement of construction.

6. Conditions B are intended to limit the time period of the Approval.

7. Conditions C are included to provide the minimum performance requirement considered necessary to prevent an Adverse Effect resulting from the operation of the Equipment and to ensure that the noise emissions from the Equipment will be in compliance with applicable limits set in the Noise Guidelines for Wind Farms and to ensure that the Equipment is constructed, installed, used, operated, maintained and retired in a way that meets the regulatory setback prohibitions set out in Ontario Regulation 359/09.

8. Conditions D and E are included to require the Company to gather accurate information so that the environmental noise impact and subsequent compliance with the Act, O.Reg. 359/09, the Noise guidelines for Wind Farms and this Approval can be verified.

9. Conditions F, G, H, I, and J are included to ensure that the Facility is constructed, installed, used, operated, maintained and retired in a way that does not result in an Adverse Effect or hazard to the natural environment or any persons.

10. Conditions K are included to protect archaeological resources that may be found at the project location.

11. Conditions L are include to ensure continued communication between the Company and the local residents.

12. Conditions M are included to emphasize that the Equipment must be maintained and operated according to a procedure that will result in compliance with the Act, the regulation and this Approval.

13. Conditions N are included to require the Company to keep records and provide information to staff of the Ministry so that compliance with the Act, the regulation and this Approval can be verified.

14. Conditions O are included to ensure that any complaints regarding the construction, installation, use, operation, maintenance, or retirement of the Facility are responded to in an efficient manner.

15. Conditions P are included to ensure continued communication between the Company and Aboriginal communities.

16. Condition Q is included to ensure that the Facility is operated under the corporate name which appears on the application form submitted for this Approval and to ensure that the Director is informed of any changes.

Schedule A

Coordinates of the Equipment

Wind Turbine Generators: Siemens 2.221-101; 80 m towers					
ID	Coordinates, UTM z17 NAD83		ID	Coordinates, UTM z17 NAD83	
	Easting, m	Northing, m		Easting, m	Northing, m
WTG-001	576124	4749873	WTG-032	590737	4746531
WTG-003	574742	4748226	WTG-033	594906	4747489
WTG-004	575685	4748309	WTG-034	588348	4744337
WTG-005	576990	4748661	WTG-035	588779	4744087
WTG-006	578518	4748834	WTG-036	589271	4744225
WTG-007	579869	4749156	WTG-037	589975	4744279
WTG-008	580947	4749341	WTG-038	591475	4744600
WTG-009	586015	4749711	WTG-039	591880	4745113
WTG-010	586837	4749912	WTG-040	592721	4744952
WTG-011	587326	4751141	WTG-041	593224	4745318
WTG-012	572316	4746292	WTG-042	593522	4745702
WTG-013	572920	4746475	WTG-043	594899	4745794
WTG-014	574224	4746586	WTG-044	596210	4746279
WTG-015	576150	4746799	WTG-045	596181	4745775
WTG-016	577821	4747047	WTG-046	597119	4745943
WTG-017	582468	4747896	WTG-047	597181	4746416
WTG-018	588422	4748589	WTG-048	590280	4742517
WTG-019	590644	4749342	WTG-049	590293	4742174
WTG-020	573903	4745199	WTG-050	590314	4741857
WTG-021	577726	4746477	WTG-051	592008	4742791
WTG-022	579685	4746426	WTG-052	593087	4743349
WTG-023	580952	4746798	WTG-053	593930	4743637
WTG-024	582973	4747085	WTG-054	595213	4744131
WTG-025	583914	4747307	WTG-055	596817	4743995
WTG-026	584940	4747269	WTG-056	597076	4743766
WTG-027	586761	4746915	WTG-057	579024	4749020
WTG-028	591259	4748123	WTG-058	584373	4748649
WTG-030	587383	4745469	WTG-059	577118	4747104
WTG-031	589357	4746128	WTG-061	577924	4745876
Transformer Substation				582616	4747537

NOTICE REGARDING HEARINGS

In accordance with Section 139 of the Environmental Protection Act, within 15 days after the service of this notice, you may by further written notice served upon the Director, the Environmental Review Tribunal and the Environmental Commissioner, require a hearing by the Tribunal.

In accordance with Section 47 of the Environmental Bill of Rights, 1993, the Environmental Commissioner will place notice of your request for a hearing on the Environmental Registry.

Section 142 of the Environmental Protection Act provides that the notice requiring the hearing shall state:

1. The portions of the renewable energy approval or each term or condition in the renewable energy approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The signed and dated notice requiring the hearing should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The renewable energy approval number;
6. The date of the renewable energy approval;
7. The name of the Director;
8. The municipality or municipalities within which the project is to be engaged in;

This notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, 6th Floor
Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director
Section 47.5, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

Under Section 142.1 of the Environmental Protection Act, residents of Ontario may require a hearing by the Environmental Review Tribunal within 15 days after the day on which notice of this decision is published in the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when this period ends.

Approval for the above noted renewable energy project is issued to you under Section 47.5 of the Environmental Protection Act subject to the terms and conditions outlined above.

DATED AT TORONTO this 16th day of March, 2012

Vic Schroter, P.Eng.
Director
Section 47.5, *Environmental Protection Act*

KR/

c: District Manager, MOE Hamilton - District
Thomas Bird, NextEra Energy Canada

Appendix D
MNR Re-confirmation of the Natural Heritage Assessment

Ministry of
Natural Resources
Regional Resources Section
Southern Region
300 Water Street
4th Floor, South Tower
Peterborough, Ontario K9J 8M5

Ministère des
Richesses naturelles

Ontario

July 18, 2014

Jennifer Tuck
Director, Regulatory Affairs and Government Relations
NextEra Energy Canada, ULC
390 Bay Street, Suite 1720
Toronto, ON M5H 2Y2

RE: Proposed NextEra Energy research project 'Predicting Bat Activity and Mortality in Southwestern Ontario'

Dear Ms. Tuck,

We offer the following comments on the NextEra proposed research project specific to MNR's role under Section 28(2)(6) of the Ontario Regulation 359/09 (comment on Environmental Effects Monitoring Plan), and the Endangered Species Act. They are based on previous discussions (April 30, 2014; June 23, 2014) and the following correspondence and documents:

- Response to the MNR review comments (May 2, 2014) on proposed NextEra Energy Canada, ULC research project 'Predicting Bat Activity and Mortality in Southwestern Ontario, prepared by NextEra Energy Canada, ULC, June 11, 2014
- Study Plan for Predicting Bat Activity and Mortality in Southwestern Ontario Canada, prepared by Normandeau Associates Inc, August 21, 2013
- Application for an overall benefit permit under 17(2)(c) of the Endangered Species Act, Acoustic Bat Monitoring and Post-Construction Bat Mortality Monitoring at the Summerhaven WEC, submitted December 10, 2013
- Summerhaven Wind Energy Centre Natural Heritage Assessment Amendment Report, by Natural Resource Solutions Inc., November 2013

It is our understanding that the proposed bat activity and mortality research project will be conducted at the Summerhaven Wind Energy Centre for two years. The proposed project is seeking to defer operational mitigation at 11 turbines for a two year period should bird and/or bat thresholds be exceeded. The remaining 45 turbines will operate as per the Environmental Effects Monitoring Plan and the conditions of the Renewable Energy Approval.

Environmental Effects Monitoring Plan

Given the research project proposes to defer operational mitigation measures for two years at 11 turbines, the proposed amendments to the Environmental Effects Monitoring Plan (EEMP) detailed in the Summerhaven Wind Energy Centre Natural Heritage Assessment Amendment Report (NRSI, Nov 2013) are not in accordance with the MNR bird and bat guidelines and Section 23.1(2) of Ontario Regulation 359/09.

Endangered Species Act

If the proposed research project is conducted in accordance with a mitigation plan prepared under Section 23.20 of the Endangered Species Act (ESA) Regulation (O.Reg 242/08), no authorization under the ESA is required with respect to those species included in the mitigation plan.

If you have further questions related to this research project please contact Joe Halloran, Regional Species at Risk Specialist at joe.halloran@ontario.ca or call 705-755-5353.

Sincerely,

Michael Gatt
A/Regional Land Use Planning Supervisor
Southern Regional Resources Section
Ministry of Natural Resources
(705) 755-3209

cc: Sarah Raetsen, Senior Project Evaluator, MOECC
Janine Bacquie, NextEra Energy Canada, ULC
Clairissa Myschowoda, A/Renewable Energy Program Coordinator, MNRF
Lesley Hale, Science Specialist - Renewable Energy, MNRF
Joe Halloran, Regional Species at Risk Specialist, MNRF