CONESTOGO WIND FARM
Post Construction Follow-up Plan

Prepared for:
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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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1.0 Introduction

The Conestogo Wind Farm is a facility that will be located south of the Town of Arthur, in Mapleton Township and the County of Wellington, ON. This project is comprised of 10 wind generating turbines with a maximum capacity of 22.91MW. Pre-construction natural environment studies have been conducted by several environmental consulting firms, including Natural Resource Solutions Inc (NRSI), LGL Ltd., Dave Martin, and Pandion Systems. This information has been compiled into a complete Natural Heritage Assessment by Genivar in accordance with the Renewable Energy Approval (REA) regulations.

For the development of this *Conestogo Wind Farm: Post-construction Follow-up Plan*, NRSI has used their extensive post-construction monitoring experience, review of the most current guidelines released by the Ministry of Natural Resources (MNR) and Environment Canada (2007), and correspondence with Dave Martin, who completed pre-construction avian surveys and provided recommendations relating to post-construction monitoring.

The following post-construction monitoring protocol will be implemented at the Conestogo Wind Farm.

2.0 Purpose

The purpose of post-construction monitoring at the Conestogo Wind Farm is to verify the accuracy of the environmental assessment of the project, with special focus on bird and bat activity and to determine the effectiveness of any mitigation measures that are implemented to mitigate adverse environmental effects of this project.

The Ministry of Natural Resources also requires that the results of follow-up programs may be used for implementing adaptive management measures or for improving the quality of future monitoring programs and reports. It will then be possible to identify the impact of this wind energy facility on the avian and bat populations that utilize the Conestogo area.

The plan will ensure that any unanticipated potentially significant adverse environmental effects are detected and addressed so that they do not become significant. The adaptive management strategy contained in Section 7.2 of this Plan provides further details on how this is accomplished.

3.0 Mortality Surveys

Mortality surveys will be conducted to identify and document the number of birds and bats that are impacted at each turbine sampled. The observed moralities will be documented and collected, and the total mortalities observed will be used to determine the estimated injuries and mortalities at the Conestogo Wind Farm. Estimated rates use numerous variables to extrapolate the observed mortalities using scavenger removal rates, searcher efficiency rates, and proportion of turbines searched (if applicable). The observed and estimated results will be expressed as the total estimated fatalities/turbine/year and fatalities/MW/year. Comparisons between pre-construction and post-construction activity data will be possible to aid in determining any potential negative impacts to bat populations in the area. The specific post construction follow-up plan, to assess impacts to bird and bat populations, is outlined in detail below.

3.1 Monitoring Period

The proposed post-construction mortality monitoring period for bats is based on the 2010 working draft *Bats and Bat Habitats: Guidelines for Wind Power Projects* (MNR 2010). This document recommends that a time period of May 1st to September 30th, corresponding to the peak period of bat activity, be surveyed for bat mortality. These surveys should be conducted every three days, which roughly corresponds to twice weekly, and are recommended to occur for a total of three years following the completion of the facility.

In addition to the May 1st to September 30th time period, identified above, post-construction monitoring will also occur from October 1st to November 30th during the anticipated periods of fall bird migration. Surveys throughout October will continue to occur twice weekly, with November surveys occurring weekly. This change in frequency is a result of a shift in focus from passerine migration to potential raptor interactions at this facility.

As such. mortality monitoring will be conducted at the Conestogo Wind Farm from May 1st to October 31st, occurring twice weekly (approximately every 3 days) and from November 1st to November 30th, occurring weekly. Should the turbines become operational within this monitoring period, post-construction monitoring should begin as soon as possible (when more than 50% of the turbines are operational), resulting in an abbreviated first year of monitoring. During each visit, all bird and bat mortalities will be documented in accordance with appropriate MNR and EC recommendations.

Based on the location of this project and placement of turbines away from sensitive habitats, NRSI recommends that the results of mortality monitoring should be discussed with appropriate agency staff following the completion of each year of monitoring. These discussions should be used to identify potential changes to monitoring effort, timing, or other methodology relating to the post-construction monitoring at this facility.

3.2 Sample Locations

Based on the relatively small size of the Conestogo Wind Farm (10 turbines), all turbines will be searched following the monitoring period and search frequency identified above.

All turbines selected for mortality monitoring will be surveyed on the appropriate dates and for the given time period regardless of cover type. Although agricultural and field habitats may have implications on mortality results, this will be addressed in the comprehensive searcher efficiency trials discussed below, and will be considered, in detail, during the analysis and reporting phase of this plan.

3.3 Sample Area

Current MNR recommendations indicate that a search radius of 50m around the turbine base should be implemented. This search area will be implemented for all mortality searches at the Conestogo Wind Farm. The time spent at each turbine will be kept constant for the purposes of accurate mortality estimates and comparative results between searchers, and will be limited to a search effort of 20 minutes at each turbine.

The searchable area of turbines will vary considerably between individual turbines, and will be largely dependent on the chosen crop type. Regardless of ground cover, the same 50m search radius will apply to all turbines to be searched. If searcher efficiency or scavenger rates are noticeably different between visibility classes, estimated mortality rates will be calculated separately for the different visibility classes, as outlined in the MNR Bat Guidelines (OMNR 2010).. Estimated rates for different visibility classes will be addressed separately and combined for estimated mortality rates based on site-specific characteristic information at individual turbine locations.

Percent Area Searched (Ps):

Based on post-construction data gathered to date in Ontario most birds and bats appear to fall within 50m of a wind turbine base and therefore this search area radius will be used to calculate the percent area searched. Since it may not always be possible to search the entire 50m search area (because of the presence of thick or tall vegetation, steep slopes, active cultivation, etc.), the actual area searched during the mortality surveys must be calculated at each turbine, using a GPS, or comparable method as approved by the MNR. Searching should be undertaken uniformly (eg. using a set transect width) throughout the searchable area, so that all parts of it are searched with equal intensity.

A description of areas deemed to be unsearchable, if any, will be detailed in the follow-up report (e.g. vegetation height, type, slope, etc) using the visibility classes identified by the MNR. Percent area searched (Ps) will be calculated as follows:

Percent area searched (Ps) = actual area searched / πr^2

r: 50m

3.4 Estimated Mortality

In addition to total bird and bat mortalities observed, estimated mortality rates will also consider the results of searcher efficiency, scavenger removal trails, and percent area searched (see Sections 3.3, 4.0 and 5.0) using the following general formula for corrected mortality estimates:

Corrected Mortality Estimates (C) = c / (Se x Sc x Ps)

C: the corrected number of bird or bat fatalities
C: the number of carcasses found
Se: the proportion of carcasses expected to be found by searchers (searcher efficiency)
Sc: the proportion of carcasses not removed by scavengers over the search period
Ps: the percent of the area searched.

The above formula can be used to address estimated mortality rates during specific time periods, locations, or habitat types, providing all variables used are specific to the desired criteria. This can allow for estimated mortality rates for specific time periods (i.e. the month of August), at turbines in proximity to specific habitat types, at specific turbine locations, etc, and will be extremely beneficial in identifying potential spatial and temporal risks to bat populations. Should apparent differences between searcher efficiency or scavenger results be observed between habitat types, crop cover, locations, or other variable factors, the above formula will be used separately for each appropriate set of conditions or variables.

Searcher efficiency results will be incorporated into the above equation by using the equation detailed in Section 5.0. Variable efficiencies between searchers will also be addressed in the equation. Further subdivided equations (i.e. # carcasses found in soy/total # of carcasses placed in soy) may be used in the estimated mortality equation, described above, if noticeable spatial or temporal differences are noted. All equations, and methods, used to derive estimated mortality will be detailed in the final reporting.

Results of scavenger removal trials will be incorporated into the final estimated mortality equation following the formula seen in section 4.0. Scavenger rates will be determined monthly to address temporal changes in scavenger activity and changes in ground cover, and any other noticeable factors, such as proximity to natural features, may also be taken into consideration during the final estimated mortality rates. All equations, and methods, used to derive estimated mortality will be detailed in the final reporting.

3.5 Documentation and Reporting

When carcasses are found, they will be safely collected, identified to species (if possible), photographed, labeled, sealed in a bag and stored in a freezer for future reference, if needed. Collected bird and bat specimens may be used for searcher efficiency or scavenger trials for this, or future, projects. Species identification should be conducted by knowledgeable field biologists using accepted identification criteria. All appropriate information, such as distance and direction from the turbine base, UTM location, date, time, etc. will be recorded for analysis purposes. All searchers should

have updated rabies pre-exposure vaccinations and will follow detailed safety protocol for handling dead animals. Cause of death, and obvious external injuries, will be noted if apparent, and the condition of the carcass will be classified according to the following table, described by Environment Canada (2007).

Code	Description
I	Injured or dying
F	Freshly dead (probably within last 48 hrs), little insect scavenging or decay
R	Recently dead (probably >48 hrs but < 1 week), some insect scavenging/decay
D	Decomposed (probably dead > 1 week), possibly not identifiable to species

In addition to apparent injuries and cause of death, biologists will conduct a preliminary inspection of bat carcasses for the presence of white-nose syndrome, using information already obtained by appropriate provincial agencies, including the MNR and Canadian Cooperative Wildlife Health Centre (CCWHC). As requested by the MNR on other projects, any resident bat species found during mortality surveys should be transferred to the University of Guelph CCWHC for further assessment of white-nosed syndrome. NextEra Energy Canada is committed to continue to assist researchers in watching for the spread of this fungus within Ontario populations.

As part of a detailed post-construction monitoring report, a map will be produced that identifies where carcasses have been found within the project area. This map will be useful for studies to determine trends with respect to bat mortalities due to wind turbines.

A detailed report on the results of mortality monitoring and analysis of these results will be prepared and provided to the MNR, EC, and/or Ministry of the Environment (MOE) during the winter following the completion of the first year of monitoring.

4.0 Scavenger Removal

Levels of carcass scavenging will be determined through carcass removal trials. In these trials, various sized bird and bat carcasses will be placed around the wind turbines and monitored for two weeks or until they disappear, whichever occurs first. The rate of carcass removal will be considered in determining the estimated total bird and bat mortality.

During all scavenger removal trials, carcasses will be discreetly marked with identification numbers, and placed in such a manner to limit the human influence on the carcass and surrounding area. These trials will include both bird and bat carcasses, and will follow MNR and EC recommendations for scavenger removal trials. Bird carcasses will represent native species to Ontario, and bat carcasses will only include migratory bat species or resident bats species that have been confirmed by regulatory agencies to show no signs of white-nose syndrome. All carcasses should be fresh or have been frozen when freshly dead. Carcasses will be placed during the early morning hours and located at varying distances from the turbine base in representative habitats that will be searched during mortality searches.

Scavenger removal trials will be conducted once per month during the entire monitoring period of May through November, which is consistent with Environment Canada and MNR scavenger trial recommendations. Trials will occur at all 10 turbines, and will utilize at least 10 carcasses during each monthly trial. The presence of each specimen will be noted on each monitoring day for a period of 2 weeks (4 visits). Signs of scavenging, including tracks, changes in position or location of the specimen, or specimen alteration, will also be noted during the scavenging surveys. The rate of scavenging will be determined using the following equation.

Scavenger Correction Factor (Sc):

Proportions of carcasses remaining after each search interval are pooled to calculate the overall scavenger correction factors:

$$Sc = \frac{nvisit1 + nvisit2 + nvisit3}{nvisit0 + nvisit1 + nvisit2}$$

Sc: proportion of carcasses not removed by scavengers over the search period
nvisit0: total number of carcasses placed
nvisit1 – nvisit3: numbers of carcasses remaining on visits 1 through 3

5.0 Searcher Efficiency

Searcher efficiency trials are designed to correct for carcasses that may be overlooked by surveyors during the survey periods. Searcher efficiency will vary for each individual based upon their own unique characteristics. Searcher efficiency trials involve a "tester" that places bird and bat carcasses under WTGs prior to the standard carcass searches to test the searcher's detection rate. Searcher efficiency trials will involve a known number of discreetly marked carcasses placed around a wind turbine. Following the mortality survey of a particular turbine, the number of carcasses found by a searcher is compared to the total number of carcasses placed. Searcher efficiency is another important factor in creating an estimate of total bird and bat mortality.

As recommended by the MNR, searcher efficiency trials should be conducted at least once per season during the entirety of the monitoring program, unless changes to the landscape warrant more frequent trials. Due to the project location in active agricultural fields, NRSI anticipates considerable changes in monthly visibility throughout the monitoring period. As a result, searcher efficiency trials will be conducted once per month during the entirety of the monitoring program. Searcher efficiency will be conducted every month on each searcher that worked at the Conestogo Wind Farm during that given month. All searcher efficiency trials will be conducted without the knowledge of the searcher, and will use varying numbers of birds and bats of different sizes and species, typically totaling at least 10 specimens. Carcasses will be placed randomly at turbines that will be surveyed, and will be placed in a range of visibility classes, crops, or substrates present within the search area. In the case that a trained dog is also used for mortality surveys, the dog and handler will be tested as a team.

Searcher efficiency birds/bats will be discreetly marked, and placement location will be documented using UTM coordinates so that any unfound specimens can be collected to be used in future searcher efficiency or scavenger trials. Native bird species and migratory bat species will be used during all searcher efficiency trials.

Environment Canada (2007) and the MNR (OMNR 2010) have provided detailed recommendations on determining searcher efficiency, expressed as a proportion of carcasses expected to be found by individual searchers. Searcher efficiency (Se) is calculated for each searcher as follows:

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

The number of turbines that each individual searches will vary so it will be necessary to calculate a weighted average that reflects the proportion of turbines each searcher searched. The weighted average or overall searcher efficiency will be calculated using the following equation:

$$S_{eo} = S_{e1}(n_1/T) + S_{e2}(n2/T) + S_{e3}(n_3/T)$$

S_{eo}	is the overall searcher efficiency
S_{e1} and $_2$ and $_3$…	are individual searcher efficiency ratings
N_1 and $_2$ and $_3$…	are number of turbines searched by each searcher
T	is the total number of turbines searched by all searchers

6.0 Permitting and Species At Risk

All appropriate permits will be obtained by the company or individual conducting follow-up monitoring at the Conestogo Wind Farm. This will include a Migratory Bird Scientific Collector's Permit, distributed by Environment Canada, and Wildlife Scientific Collector's Permit, issued by the Ministry of Natural Resources. Natural Resource Solutions Inc. currently holds a Migratory Bird Scientific Collector's Permit, and holds multiple Wildlife Scientific Collector's Permits for a variety of other projects, including wind energy facilities, in Ontario. A site-specific Wildlife Scientific Collector's Permit will need to be obtained for the Conestogo post-construction monitoring. Other permits that may be required will be investigated and obtained through the appropriate agencies.

Based on the potential to encounter Species At Risk while conducting follow-up monitoring at the Conestogo Wind Farm, a permit under the *Endangered Species Act (2007)* may be required in the event that a SAR is encountered during mortality surveys. The need, if any, to obtain this permit prior to the onset of post-construction monitoring should be discussed in detail with the Guest District MNR Species At Risk biologist well in advance of the proposed operational date.

Should any Species At Risk be encountered either during, or after the completion of, follow-up monitoring, the MNR and/or EC will be informed immediately.

7.0 Notifications and Adaptive Management

The Proponent is responsible for notifying MNR and/or EC when the results from post-construction surveys exceed specific thresholds (see section 7.1) for mortality events and disturbance/behavioural impacts. The thresholds are conservative in an attempt to forecast and manage unpredicted adverse environmental effects before they become significant.

When a notification threshold has been exceeded, the relevant agencies will be immediately contacted, presented with the data and asked to consider if adaptive management and/or mitigation measures and/or additional monitoring/analysis are necessary. The contacted agencies will review the data and other relevant factors (e.g., weather conditions, distribution of impact among turbines, species composition etc.) and provide recommendations which could involve adaptive management and/or mitigation measures. As circumstances permit, immediate mitigative action may be taken prior to contacting the Parties if it is deemed necessary by the proponent.

7.1 Mortality Event Thresholds

EC and/or the MNR will be immediately informed if the following thresholds are exceeded during mortality surveys.

Single Mortality Event – Migratory Birds	10 or more birds are found at any one wind turbine, or 33 or more birds are found at multiple wind turbines during a single mortality monitoring survey. These thresholds are applicable to all projects, regardless of size (e.g. number of turbines or MW).
High Annual Mortality Rates - Raptors (including Vultures)	0.2 raptors/turbine/year (all raptors) 0.1 raptors/turbine/year (raptors of conservation concern)
High Annual Mortality Rates – Migratory Birds	Projected annual mortality level of all birds, derived after one full monitoring period, is greater than or equal to 18 birds/turbine/year. This number represents the actual (corrected) number of fatalities. The observed number of fatalities will be adjusted using site-specific measures of scavenger removal, searcher efficiency and percent area searched to obtain the actual (corrected) number of fatalities. If correction factors are not yet available, reasonable estimates will be assumed.
High Annual Mortality Rates - Bats	Projected annual mortality level of all bats, derived after one full monitoring period, is greater than or equal to 10 bats/turbine/year. This number represents the actual (corrected) number of fatalities. The observed number of fatalities will be adjusted using site-specific measures of scavenger removal, searcher efficiency and percent area searched to obtain the actual (corrected) number of fatalities. If correction factors are not yet available, reasonable estimates will be assumed.

Single Mortality Event - Species At Risk	Any and all mortality of species at risk (i.e., a species listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal *Species at Risk Act* or a species listed on the Species at Risk in Ontario list as Extirpated, Endangered, Threatened, or Special Concern under the provincial *Endangered Species Act*, 2007).

8.0 Review of Reports & Adaptive Management

8.1 Reporting and Review

Following the completion of the detailed post-construction monitoring outlined above, a comprehensive post-construction mortality report will be completed. This report will summarize the results of the bird behaviour and will document all observed mortalities, searcher efficiency and scavenger rates, and will provide estimated mortality rates based on the findings. Following the completion of this report, the data will be presented to the Ministry of Natural Resources, and any other appropriate agency for their review.

Following the agency review of the findings and recommendations, all parties will discuss the need, if any, for further post-construction monitoring in subsequent seasons. Should additional monitoring be deemed necessary, a subsequent follow-up monitoring program should be developed that addresses any changes in monitoring effort or methodology based on the findings of the first year of post-construction mortality surveys.

The information that will be considered during the assessments for the need for additional post-construction monitoring or the implementation of adaptive management practices will include a variety of field information such as behavioural effects on migratory raptors or other avian species , total observed mortalities, estimated mortality rates, and the species being impacted. All of this information will be evaluated and compared with other available literature, both in Ontario, as well as at other projects in comparable habitats or geographical location, including information provided in the MNR's *Wind Power and Bats: Bat Ecology Background Information and Literature Review of Impacts* (2006). Following a detailed review of this information and consultation with appropriate agencies, appropriate actions or Plan alterations and/or extensions will be implemented.

8.2 Adaptive Management

Upon provision of a notification according to section 7 and upon submission of the detailed post-construction report, the proponent, MNR, and EC will review the information available to determine if adaptive management measures are necessary to address any unexpectedly high impacts observed. It may be determined that further information is needed for decision making or that mitigation measures are needed.

Further investigations to identify those factors that may be contributing to the high levels of mortality (e.g., weather conditions, time of year when bird density is particularly high) may include, but not be limited to:

- increasing survey frequency for decision support
- increasing reporting frequency to speed decision-making
- adding behavioural or movement surveys (depending on the species involved)

Potential mitigation measures, if deemed necessary, will likely focus on sensitive time periods, such as fall raptor migration, fall bat migration, or the summer swarming period of local bat populations.

The Ministry of Natural Resources has provided guidelines for mandatory operational mitigation measures pertaining to bat mortality (OMNR 2010). In any instance where post-construction mortality monitoring exceeds the stated threshold of 10 bats/turbine/year, the MNR requires implementation of an increase of cut-in speed to 5.5 m/s, or feathering of turbine blades at wind speeds below 5.5 m/s. This mitigation measure will implemented, beginning the following calendar year from July 15 to September 30 from sunset to sunrise. In addition to the implementation of operational mitigation, the MNR also requires an additional 3 years of post-construction monitoring if this threshold of 10 bats/turbine/year is surpassed.

Operational mitigation, in the event that avian thresholds are surpassed, may include temporary turbine shut-down, or feathering the blades during specific time periods. Due to the variance in bird activity and behaviour, operation mitigation (if any) will be largely dependent on site-specific post-construction results and will be discussed with agency staff. In the event that thresholds are exceeded, an additional 2 years of mortality monitoring may be required for sites located more than 120m from significant wildlife habitat. An additional 3 years of mortality monitoring may be required for sites that are located within 120m of significant wildlife habitat.

9.0 Roles of the Parties

In all cases the Parties noted below will work in a collaborative manner in designing and carrying out this PCFP.

Proponent
NextEra Energy Canada has overseen the design of the PCFP, and will implement the Plan to the satisfaction of the MNR. It is also the responsibility of NextEra Energy to implement any adaptive management measures, described above, if necessary, and to provide detailed monitoring results to all appropriate agencies, including MNR, EC, and MOE for their review and comment.

The proponent is also responsible for meeting the requirements of any legislation that is applicable to the project and obtaining any required approvals or permits.

Required permits may include a scientific collector's permit under authority of the *Migratory Birds Convention Act*, a scientific collector's permit under the *Fish and Wildlife Conservation Act*, and any permits required under the *Species at Risk Act* or *Endangered Species Act*.

Ministry of Natural Resources (MNR)
The MNR's jurisdictional scope is related to bird and bat species as mandated by the *Fish and Wildlife Conservation Act* (FWCA). The MNR's jurisdiction also includes species and their habitats in accordance with the *Endangered Species Act, 2007.*

The MNR will be responsible for reviewing the Proponent's applications for required permits, such as a scientific collector's permit under the *Fish and Wildlife Conservation* and any permits required under the *Endangered Species Act, 2007,* and providing those permits when deemed appropriate.

For any issues associated with a species identified under both the federal *Species at Risk Act, 2003* and the Ontario *Endangered Species Act, 2007*, discussions will take place with EC and/or the MNR as each of those agencies considers appropriate.

The MNR will also provide expert information or knowledge in its possession. The MNR will also be responsible for providing any advice concerning the implementation of the PCFP, as necessary.

The MNR will review the follow-up report(s) and any mortality event notifications and provide comments and expert advice to the MOE and EC, if necessary.

Environment Canada (EC)
EC's jurisdictional responsibilities relate to the protection of migratory birds and Species at Risk as mandated by the *Migratory Birds Convention Act, 1994* (MBCA), and the federal *Species at Risk Act* (SARA).

The disturbance, destruction or taking of a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird are prohibited under section 6 of the *Migratory Bird Regulations* (MBRs), under the authority of the *Migratory Birds Convention Act, 1994* (MBCA)*. "Incidental take" is the killing or harming of migratory birds due to actions, such

as economic development, which are not primarily focused on taking migratory birds. No permit can be issued for the incidental take of migratory birds or their nests as a result of economic activities.

Under the legislated prohibitions of SARA, EC is the competent Ministry with the responsibility to protect individuals and residences of all terrestrial species listed on Schedule 1 of SARA on federal lands, and federally regulated migratory bird species at risk off federal lands.

EC will be responsible for reviewing the Proponent's applications for required permits, such as a scientific collector's permit under the *Migratory Bird Convention Act, 1994*, and providing those permits when deemed appropriate.

For any issues associated with a species identified under both the federal *Species at Risk Act, 2003* and the Ontario *Endangered Species Act, 2007* (ESA), discussions will take place with EC or MNR or both as each of those agencies considers appropriate.
EC, as a Federal Authority under CEAA with specialist or expert information or knowledge with respect to this Project, EC will be responsible for providing, on request, specialist or expert information or knowledge in its possession. EC will also be responsible for providing any assistance concerning the design and implementation of the PCFP.

EC will review the follow-up report(s) and any mortality event notifications and provide comments and expert advice to the MNR and the Proponent.