

Attachment C

Environmental Effects Monitoring Plan for Wildlife and Wildlife Habitat

July 3, 2014

Suncor Energy Products Inc.
150 6th Avenue SW
Calgary AB T2P 3E3

RE: Environmental Effects Monitoring Plan for the Cedar Point Wind Energy Project

Dear Christopher Scott:

MNR has reviewed the Environmental Effects Monitoring Plan (EEMP) for the Cedar Point Wind Energy Project located in Lambton County. The final document is titled Suncor Energy, Cedar Point Wind Energy Project, Environmental Effects Monitoring Plan for Wildlife and dated April 2013.

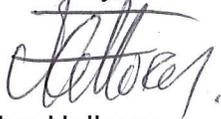
This letter confirms that the EEMP was prepared in respect of birds and bats in accordance with the Ministry of Natural Resources:

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

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

If you wish to discuss, please contact Joe Halloran at joe.halloran@ontario.ca or 705-755-3225

Sincerely,



Joe Halloran
Land Use Planning Team
Southern Region MNR



SUNCOR ENERGY
CEDAR POINT WIND ENERGY PROJECT
ENVIRONMENTAL EFFECTS MONITORING PLAN
FOR WILDLIFE

File No.: 160960709
April 2013

Prepared for:

Suncor Energy Products Inc.
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Calgary AB T2P 3E3

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1.0 Introduction

1.1 PROJECT OVERVIEW

Suncor Energy Products Inc. (“Suncor”) is proposing to develop the Cedar Point Wind Power Project (the ‘Project’) within the Town of Plympton-Wyoming, Township of Warwick, and the Municipality of Lambton Shores, all within Lambton County, Ontario. The Project was awarded a Feed-In-Tariff (FIT) contract with the Ontario Power Authority (OPA) in July, 2011 for up to 100 MW (FIT Contract F-002175-WIN-130-601).

It is envisioned that the proposed Project will include up to 46 wind turbines. The proposed Project would also include access roads, meteorological towers (met towers), electrical collector lines, substation, and a 115 kV transmission line. Suncor has elected to assess and seek approval for some alternative Project configurations. The Renewable Energy Approval (REA) application process will consider up to nine (9) alternative turbine locations. Final selection of the turbine sites will be determined prior to Project construction and will be based on consultation activities, potential effects assessments, and detailed design / engineering work.

The Project Location includes all land and buildings/structures associated with the Project and any air space in which the Project will occupy. This includes structures such as turbines, access roads and power lines that will be utilized throughout the life of the Project. A “Zone of Investigation” has been identified based on the requirements of O. Reg. 359/09. The zone of investigation encompasses the Project Location and an additional 120 m surrounding the Project Location (50 m surrounding collector lines and the transmission line).

The proposed Project would also include access roads, up to three meteorological towers (met tower), electrical collector lines, a substation and a transmission line. The project will connect to the provincial high voltage transmission system via a transmission line system and transformer station constructed owned and operated by subsidiaries of NextEra Energy Canada (NextEra). Temporary components during construction may include storage and staging areas at the turbine locations, crane pads or mats, staging areas along access roads, delivery truck turnaround areas, and a central laydown area (located at the substation). Project development activities will continue and if successful, construction is scheduled to commence in early 2014. Commercial operation is currently planned for December 2014.

The project is proposed to be developed on private land at the following location(s):

Upper-tier Municipality:	County of Lambton
Lower-tier Municipality:	Town of Plympton-Wyoming, Municipality of Lambton Shores, Township of Warwick
Geographic Township:	Townships of Warwick, Bosanquet, and Plympton
Lot(s) and Concession(s):	Various

1.2 REPORT REQUIREMENTS

This Mitigation and Environmental Effects Monitoring Plan (EEMP), which includes the Post-Construction Monitoring Plan is one component of the REA application for the Project, and has been prepared in accordance with O. Reg. 359/09, the Ontario Ministry of Natural Resources' (MNR's) *Approval and Permitting Requirements Document for Renewable Energy Projects* (September 2009), the MOE's *Technical Guide to Renewable Energy Approvals*, MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

As discussed in the Project's Natural Heritage Assessment and Environmental Impact Study (NHA/EIS), primary data were collected through bird and wildlife baseline studies in the Project Boundary. These data were augmented with secondary data from published and unpublished sources to generate a dataset from which to assess the potential effects of the Project.

The potential environmental effects to wildlife and wildlife habitat and associated mitigation measures, based upon this dataset, ornithological advice, and professional opinion, among other factors, are provided in NHA/EIS Section 5. Additionally, wildlife and wildlife habitat post-construction monitoring commitments are summarized in Table 5.3, Appendix B of the NHA/EIS. These commitments provide the first step of confirming the predictions of the EIS and provide the basis from which actions contained in the EEMP may stem.

The purpose of this EEMP is to assess the effectiveness of the proposed mitigation measures and to verify compliance of the Project with applicable provincial and federal legislation and guidelines. This monitoring plan provides details on the post-construction wildlife monitoring program for Hooded Warbler and Wood Thrush habitat, woodland amphibian breeding habitat, plant species of conservation concern, and mortality monitoring of birds and bats.

2.0 Pre-Construction Monitoring Program

2.1 PURPOSE AND TIMING

A number of habitat features were treated as significant in the NHA and EIS as they had not yet been evaluated. These features will be evaluated prior to construction in the appropriate season for each type of habitat. If the habitat is deemed significant as a result of habitat use studies, the mitigation proposed in **Table 5.3, Appendix B** (NHA) will be applied. However, if the feature is deemed not significant no mitigation will be applied for that feature. The environmental effects monitoring plan for each feature includes the post-construction survey methods, monitoring locations, frequency and duration of sample collection, technical and statistical value of the data, and reporting requirements. The locations of these features are provided in **Figures 4.1-4.10** in the NHA/EIS report.

2.2 METHODS

A number of wildlife habitats were treated as significant for the purposes of this report and will be evaluated prior to construction. If these habitats are deemed significant as a result of habitat use studies, the mitigation proposed in **Table 5.3, Appendix B** of the NHA will be applied, which includes post-construction monitoring. However, if a feature is deemed not significant, no mitigation will be applied for this feature. The methods to evaluate the significance of these features are detailed below.

Plant Species of Conservation Concern (Features 3, 6, 7, 10, 18, 19, 20, 23 and 24)

Where vegetation removal is proposed, the proponent must commit to additional botanical surveys in these locations pre-construction in order to ensure that no plant species of conservation concern will be removed through this process.

Spring and summer botanical surveys will be conducted in these features, which will consist of thorough area searches in spring (May/June) and summer (July/August). There are no required weather conditions within which to conduct these surveys, as long as the plant species are visible. Observers will record:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).
- Date and time of day.
- Duration of area search.
- GPS coordinates of any plant species of conservation concern, including marking the location with flagging tape on a nearby tree.

- Name of the observer doing field work.

If any of the habitats is deemed significant as a result of these area searches, the mitigation proposed in **Table 5.3, Appendix B** of the NHA will be applied, which includes post-construction monitoring. However, if the feature is deemed not significant no mitigation will be applied. If any plant species of conservation concern are found in these habitats, transplantation will occur in consultation with the MNR in the appropriate season. See Sections 5.2.1.1, 5.2.1.2, and 5.3.1 for more information on vegetation removal mitigation measures.

Hooded Warbler Habitat (Features 45, 48, 55, 56 and 62) and Wood Thrush Habitat (Features 3, 6, 10, 18, 19, 23, 26, 28, 30, 32, 45, 48, 52, 55, 56, 58, 59 and 62)

The primary mitigation strategy applied to this feature was avoidance. Appendix D of the Natural Heritage Assessment Guide identifies that an operational impact may occur when a wind turbine is located within 120 m of a significant bird habitat. As per the requirements of Appendix D of the *Natural Heritage Assessment Guide for Renewable Energy Projects* (MNR, 2011a), due to the location of proposed turbines within 120 m of Features 45, 48, 55, 56 and 62 (for Hooded Warbler) and Features 3, 6, 10, 18, 19, 23, 26, 28, 30, 32, 45, 48, 52, 55, 56, 58, 59 and 62 (for Wood Thrush) the proponent must commit to undertaking studies to determine the actual use of the habitat by these two species prior to any construction activities occurring within 120 m of the habitat. Habitat use studies will be conducted according to *“Bird and Bird Habitats: Guidelines for Wind Power Projects”* (MNR, 2011c). Point count stations will be located approximately 250 m apart throughout each candidate habitat. The approximate locations of these surveys are shown on **Figures 5.1-5.10, Appendix A** of the NHA, but these locations may be refined in the field. Each of the surveys will include a ten-minute point count at each location, conducted during the breeding season (May 1 to July 31). Each station will be surveyed a minimum of 3 times: once early in the season (May); once in mid-season (June); and, once later in the season (July) with at least 10 days between surveys at a particular station. Point counts must be performed in the early morning, between dawn (one half hour before sunrise) and about 4 hours after sunrise. Surveys in late June and early July will be completed within 3 hours of sunrise. Surveys will be performed when the wind speed is 3 or less on the Beaufort scale and when there is no precipitation.

At each station, the surveyor will observe for ten minutes, recording all species seen or heard (including Hooded Warbler and Wood Thrush), along with an estimate of the number of individuals of each species and the highest level of breeding evidence observed. Surveyors will estimate the distance to each bird using a scale of 0–50 m, 50–100 m and further than 100 m. Birds that move during the survey will be recorded in the closest distance category that they entered during the survey. Data that will be reported are the number of birds of each species detected in each distance band. Birds that fly over without stopping should be recorded separately as ‘fly-overs’. Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).

- Date and time of day.
- GPS coordinates of each point location (same location is to be used for each survey).
- Name of the observer doing field work.

If any of the habitats is deemed significant as a result of habitat use studies, the mitigation proposed in **Table 5.3, Appendix B** of the NHA will be applied, which includes post-construction monitoring. However, if the feature is deemed not significant no mitigation will be applied.

Amphibian Breeding Habitat (Woodland): Egg Mass Surveys (Features 6, 7, 25, 26, 29, 37, 47, 56 and 57) and Anuran Call Surveys (Features 6, 25, 26, 29, 37 and 47)

The primary mitigation strategy applied to this feature was avoidance. Appendix D of the Natural Heritage Assessment Guide identifies that an operational impact may occur when an access road is located within 120 m of a significant amphibian habitat. As per the requirements of Appendix D of the *Natural Heritage Assessment Guide for Renewable Energy Projects* (MNR, 2011a), due to the location of proposed turbines within 120 m of the features listed above, the proponent must commit to undertaking studies to determine the actual use of the habitat by these species prior to any construction activities occurring within 120 m of the habitat.

Area searches will be conducted at all vernal pools within Features 6, 7, 25, 26, 29, 37, 47, 56 and 57, once in April. Egg masses found will be identified to species where possible. The location of any vernal pools identified will be recorded and mapped at the first survey in order to conduct further site visits at the same locations.

Anuran call surveys will be conducted within Features 6, 25, 26, 29, 37 and 47. Evaluation methods to follow the 'Marsh Monitoring Protocol' (BSC, 2003). Amphibian call surveys will be conducted three times in 2013 between April, May, June. In some areas of the province, primarily southern Ontario, surveys may need to begin in March, with at least 15 days between each survey. Monitoring stations will be established a minimum of 500 m apart and 3 minute surveys were performed at each station, listening for all amphibian calls within a semi-circular sampling area. The locations of these surveys will be determined in the field where vernal pooling is present at the first survey. The surveys will be conducted in the same locations for all three surveys. Surveying will begin one half-hour after sunset and end by midnight during evenings with little wind and minimum night air temperatures of 5°C, 10°C and 17°C for each of the three respective survey periods. These temperature requirements are in place because amphibian calling intensity is strongly associated with season, time of day, and weather conditions.

Additional information that will be recorded on the appropriate data forms include:

- Weather conditions (temperature, wind speed (on a Beaufort scale), % cloud cover, and presence of any precipitation should be recorded).
- Date, time of day, and duration.

- Description of habitats or areas scanned during the surveys
- GPS transects of the area searches.
- Name of the observer(s) doing field work.
- Complete list of all amphibian species observed
- Call abundance codes for each amphibian species detected as outlined below:
 - Code 1: individual calls do not overlap and calling individuals can be discretely counted; *NOTE: individual frogs need to be counted if Code 1 is assigned.*
 - Code 2: calls of individuals sometimes overlap, but numbers of individuals can still be estimated; *NOTE: individual frogs need to be counted if Code 2 is assigned.*
 - Code 3: overlap among calls seems continuous (full chorus), and a count estimate is impossible; *NOTE: individual frogs cannot be counted if Code 3 is assigned.*

If any of the habitats is deemed significant as a result of habitat use studies, the mitigation proposed in **Table 5.3, Appendix B** of the NHA will be applied, which includes post-construction monitoring. However, if the feature is deemed not significant, no mitigation will be applied.

2.3 CONTINGENCY MEASURES

Where mitigation measures are found to not be effective, the contingency measure identified in **Table 5.3, Appendix B** of the NHA will be implemented immediately. If contingency measures need to be implemented MNR will be notified immediately, and if required, MNR will be consulted to determine appropriate contingency measures.

2.4 REPORTING REQUIREMENTS

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

3.0 Post-Construction Monitoring Program

Post-construction mortality surveys are required for all Class 3 and 4 wind power projects. This Post-Construction Monitoring Plan is one component of the EEMP of the REA Application for the Project, and has been prepared in accordance with MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

3.1 MORTALITY THRESHOLDS

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

3.1.1 Bats

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

- 10 bats / turbine / year

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

3.1.2 Birds

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

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

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

3.2 POST-CONSTRUCTION MONITORING METHODS

Post construction bat and bird mortality surveys estimate bird and bat mortality from wind turbines and may identify species and specific periods of high mortality. This knowledge can be used to evaluate the success of mitigation measures, establish protocols for operational mitigation, and inform adaptive management.

Bat and bird mortality surveys identify the number of bats or birds killed per turbine over a known period of time (expressed as bats/turbine/year or birds/turbine/year). This value represents an estimate of bat and bird mortality adjusted for carcass removal rates, searcher efficiency, and percent area searched. Standard methodologies for mortality surveys are identified below.

For bats and birds, a monitoring year is considered to be from May 1 – October 31, and continues until November 30 specifically for raptor monitoring. Should additional bat or bird mortality be found based on supplemental monitoring (e.g. associated with significant wildlife habitat) and using the same standard protocols, this mortality will be included in the calculation of mortality rates. In this case, the year is all reporting periods in one calendar year (i.e. from January 1 – December 31).

Post-construction monitoring is required for 3 years at all Class 3 and 4 wind power projects. Post-construction monitoring will consist of:

- Regular bat/bird mortality surveys around specific wind turbines
- Monitoring of bat/bird carcass removal rate by scavengers (or other means)
- Monitoring of bird/bat searcher efficiency (i.e. number of bat/bird fatalities present that are actually detected by surveyors)
- Avoidance-disturbance effects monitoring (where a project is located within 120m of bat/bird SWH)
- For birds, subsequent 2 years of scoped mortality and cause and effects monitoring at individual turbines (and unmonitored turbines in near proximity), following any given year where an annual post-construction mortality report identifies significant bird or raptor mortality; and
- For bird/bats, an additional 3 years of effectiveness monitoring where mitigation is applied

All searchers will have updated rabies pre-exposure vaccinations.

3.2.1 Effort and Timing for Bird and Bat Mortality Monitoring

Minimum requirements for post-construction monitoring of bats include:

- Post-construction monitoring (including mortality surveys, carcass removal and searcher efficiency trials) will be conducted during the core season when bats are active, and in coordination of bird mortality monitoring (May 1-October 31) for the first 3 years of wind turbine operation
- Mortality surveys will be conducted at each monitored turbine twice per week (3 and 4 day intervals) from May 1 – October 31; surveys for raptor mortality will be continued once per week from November 1 – November 30.
- Bat and bird mortality surveys will occur at all turbines at wind power projects ≤ 10 turbines. For wind power projects > 10 turbines, a sub-sample of at least 30% of turbines (minimum 10 turbines) will be selected to cover representative areas throughout the project location.
- For birds, all turbines within the project location will be monitored once a month during the May 1-October 31 survey period for evidence of raptor mortalities

- Where significant annual bird mortality is identified, subsequent scoped mortality and cause effects monitoring will be conducted for 2 years at individual turbines (and unmonitored turbines in near proximity).
- Should significant bat or bird mortality be observed, and operational mitigation implemented, post-construction monitoring will be conducted for an additional 3 years from the implementation of operational mitigation to evaluate the effectiveness of the mitigation.

A total of 14 turbines will be selected to cover representative areas throughout the project location. Post-construction monitoring will begin May 1st of the year that the wind power project is fully operational. The commercial operation date of the Cedar Point Wind Farm is December 2014; therefore, it is anticipated that post-construction monitoring will begin May 1, 2014.

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

As determined in the Site Investigation in the NHA report, Turbine 14 needs to be included in post construction mortality monitoring and the following turbines need to be considered for inclusion (Turbines 5, 6, 9, 11, 21, 24, 27, 30, 36, 37, 46, 47, 50 and 54). A combination of these turbines, located near candidate bat habitat, and those spread throughout the study area were used in order to stratify the sample. Therefore, the following 14 turbines will be included in post-construction mortality monitoring: 5, 9, 14, 15, 21, 27, 29, 30, 36, 46, 47, 50, 54, and 70.

3.2.2 Carcass Searches

Carcass removal by scavengers is highly variable among sites (varying by vegetation cover, terrain and season) and must be considered when estimating total bat and bird mortality. Carcass searches will consider the following:

- The sub-sample of wind turbines that are monitored will include all habitat types and any significant wildlife habitat present at the site, and will cover the spatial distribution of the wind turbines. Wind turbines will be selected through a scientifically defensible system (e.g. stratification).
- The time required to search each turbine will vary depending on the surrounding habitat (e.g. open field vs. forest, etc.) and individual searchers, but searchers will aim for a consistent search time for all surveyed turbines (e.g. 20 minutes per turbine)
- Each surveyed turbine will have a search area that has a 50m radius
- Within this 50m radius, the search area will be examined using transects 5.0-6.0m apart allowing for a visual search of 2.5-3.0m on each side. The search area may be

rectangular, square or circular depending on turbine locations and arrangements and surrounding terrain.

- The search area of each turbine will be mapped into visibility classes according to the following table. Where the majority of the search area would not be searchable due to vegetation cover or other impediments (e.g. Visibility Class 4) these turbines will not be included in the sub-sample of monitored turbines.

%Vegetation Cover	Vegetation Height	Visibility Class
≥90% bare ground	≤15cm tall	Class 1 (Easy)
≥25% bare ground	≤15cm tall	Class 2 (Moderate)
≤25% bare ground	≤25% > 30cm tall	Class 3 (Difficult)
Little or no bare ground	≥25% > 30cm tall	Class 4 (Very Difficult)

- Where possible, ground cover around turbines will be maintained at a low level in order to facilitate more accurate bat and bird mortality surveys
- Mortality surveys that incorporate the use of trained dogs (i.e. dog handler teams to locate mortalities) to improve searcher efficiency will be considered, particularly in difficult terrain.
- All carcasses found will be photographed and recorded/labeled with species, sex, date, time, location (UTM coordinate), carcass condition, searcher, injuries, ground cover, and distance and direction to nearest turbine.
- Weather conditions including wind speed and precipitation will be included as part of the data collection.
- The estimated number of days since death, and condition of each carcass collected will be recorded in one of the following categories:
 - Fresh
 - Early decomposition
 - Moderate decomposition
 - Advanced decomposition
 - Complete decomposition
 - Scavenged
- Bird carcasses found during mortality monitoring will be collected and stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition.
- Carcasses of the following species found during bat mortality searches will be stored in a freezer and used in carcass removal or searcher efficiency trials, assuming they are in reasonable condition:
 - *Lasionycteris noctivagans* (Silver-haired Bat)

- *Lasiurus cinereus* (Hoary Bat)
- *Lasiurus borealis* (Eastern Red Bat)
- Because of white-nose syndrome contamination risks, the following species will not be used in carcass removal or searcher efficiency trials (carcasses of these species may be sent to the Canadian Cooperative Wildlife Health Centre for analysis of white-nose syndrome):
 - *Myotis septentrionalis* (Northern Long-eared Bat)
 - *Myotis lucifugus* (Little Brown Bat)
 - *Myotis leibii* (Eastern Small-footed Bat)
 - *Perimyotis subflavus* (Tricolored Bat)
 - *Eptesicus fuscus* (Big Brown Bat)

3.2.3 Carcass Removal Trials

The level of carcass scavenging must be determined through carcass removal trials. In these trials carcasses are placed around the wind turbines and monitored until they disappear. The average carcass removal time is a factor in determining the estimated bat or bird mortality. As carcass removal rates vary considerably from one site to another and seasonally, removal trials will be conducted at every wind power project for every year of monitoring.

Below are some important considerations for conducting carcass removal rate trials:

- Carcass removal trials will be conducted at least once a season (spring, summer, fall) during the same period as the mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g. crops grow, harvest, etc.)
- A minimum of 10 carcasses will be used for each trial with no more than 5 trial carcasses placed at any one time
- Carcasses will be monitored every 3-4 days in conjunction with carcass searches
- Carcass removal trials will be conducted in a variety of weather conditions. Weather conditions will be recorded
- Carcasses will be distributed across the range of different substrates/habitats and visibility classes of turbines being searched
- To the extent possible, carcass removal trials will be conducted at turbines that are not part of the carcass search sub-sample
- Carcasses will be placed before dusk using gloves and boots to avoid imparting human smell that might bias trial results (e.g. attract scavengers, etc)

- Trials will continue until all carcasses are removed or have completely decomposed (generally 2 weeks)
- To avoid confusion with turbine related fatalities, trial carcasses will be discretely marked (e.g. clipping of ear, wing, fur; hole punching ear; etc.) with a unique identification so they can be identified as trial carcasses
- Carcasses used will be as fresh as possible since frozen or decomposed carcasses are less attractive to scavengers. If frozen carcasses are used, they will be thawed prior to beginning carcass removal trials.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g. mice, brown chicks) may also be used when bird and bat carcasses are not available.
- Scavenging rates may change over time as scavengers become aware of and develop search images for new sources of food beneath turbines
- Scavenging will be determined on a site-specific basis and rates will not be assumed to be similar between sites or used in calculations for other projects.

3.2.4 Searcher Efficiency Trials

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

Below are some important considerations for conducting searcher efficiency trials:

- Searcher efficiency trials will be conducted at least once a season (spring, summer and fall) during the same period as the bat mortality surveys. Trials will be conducted once per month if vegetation changes occur during the season (e.g. crops grow, harvest, etc.)
- A 'tester' will control the trials and return to collect marked trial carcasses at the completion of the trials to determine the number of carcasses remaining and if any carcasses were scavenged or removed during the trial.
- Searcher efficiency trials are to be conducted for each individual searcher or team involved in searching for carcasses. The searcher will not be notified when they are participating in an efficiency trial to avoid potential search biases.
- A minimum of 10 carcasses per searcher per season in all applicable visibility classes (see table above) are to be used. The average per searcher across all visibility classes will be used for calculations.

- Trial carcasses will be spread out over the trial period (month or season) and conducted with the mortality surveys. A maximum of 3 trial carcasses will be placed at any one time to avoid bias and flooding the area with carcasses.
- Trial carcasses are placed for one search period only and then removed and recorded by the 'tester'
- Trial carcasses will be randomly placed within the search area and location recorded so that they can be retrieved if they are not found during the trial.
- Trial carcasses will be discreetly marked (e.g. clipping of ear, wing, leg, fur; hole-punching ear; etc.) with a unique identification so that they can be identified as a trial carcass by the tester.
- To the extent possible, bat carcasses will be used for at least one third of the carcass removal trials, and bird carcasses will comprise another third of the trial carcasses. Trials using other small brown mammal or bird carcasses (e.g. mice, brown chicks) may also be used when bird and bat carcasses are not available.
- If frozen carcasses are used, they will be thawed prior to beginning searcher efficiency trials.
- All observers will overlook some carcasses. This percentage will vary depending on the observer, the habitat and the area being searched, etc.

3.2.5 Proportion Area Searched

Based on current Ontario post-construction data, most bats and birds appear to fall within 50 m of a wind turbine base. This area therefore represents the maximum recommended search area. Since it may not always be possible to search the entire 50 m radius because of the presence of thick or tall vegetation, steep slopes, active cultivation, etc. the actual area searched during the mortality surveys will be calculated at each turbine, using a GPS. A map of the actual search area for each turbine searched, and a description of areas deemed to be unsearchable (e.g. vegetation height, type, slope, etc.), will be provided in the mortality report.

3.2.6 Calculations

Scavenger Correction Factor

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

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

Where,

- S_c is the proportion of carcasses not removed by scavengers over the search period
 n_{visit0} is the total number of carcasses placed
 $n_{\text{visit1}} - n_{\text{visit3}}$ are the numbers of carcasses on visits 1 through 3

Searcher Efficiency

Searcher efficiency (S_e) will be calculated for each searcher as follows:

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

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

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

Where,

S_{e0} is the overall searcher efficiency
 S_{e1} and S_{e2} and $S_{e3} \dots$ are individual searcher efficiency ratings
 N_1 and N_2 and $N_3 \dots$ are number of turbines searched by each searcher
 T is the total number of turbines searched by all searchers

Proportion Area Searched

Proportion area searched (P_s) is calculated as follows:

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

Where $r = 50\text{m}$

Corrected Mortality Estimates

The minimum estimated bat mortality (C) is calculated as follows:

$$C = c / (S_{e0} \times S_c \times P_s)$$

Where,

C is the corrected number of bat fatalities
 c is the number of carcasses found
 S_{e0} is the weighted proportion of carcasses expected to be found by searchers (overall searcher efficiency)
 S_c is the proportion of carcasses not removed by scavengers over the search period
 P_s is the proportion of the area searched

3.2.7 Other Considerations

- The above calculations will be presented in corrected number of bats/turbine per year and birds/turbine /year. In this context the year is from May 1 to October 31 for all bats and birds and continues until November 30 specifically for raptor monitoring.
- A separate calculation for raptor mortality will use the searcher efficiency and carcass removal results relevant to raptors.
- Carcasses may be discovered incidental to formal searches. These carcasses will be processed (i.e. collected and recorded, etc.) and fatality data will be included with the calculation of fatality rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be reported separately.
- Should additional bat or bird mortality be found based on supplemental monitoring (e.g. associated with SWH) and using the same standard protocols, this mortality will be included in the calculation or mortality rates. In this case, the year is all reporting periods in one calendar year (i.e. from January 1 to December 31).
- Tissue samples from bat and bird carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin of migrants. The local MNR office may be contacted prior to disposing bat and bird carcasses, to determine if this type of research is occurring in the area.

3.3 POST-CONSTRUCTION MITIGATION

3.3.1 Bats

Post-construction mitigation will be required where post-construction monitoring identifies disturbance effects associated with bat SWH. Operational mitigation is required if post-construction monitoring shows that a wind power project is causing significant bat mortality. Bat mortality is considered significant when mortality levels at a project location exceed 10 bats / turbine / year.

Operational mitigation refers to adjustments made to the operation of wind turbines to help mitigate potential negative environmental effects on bats (i.e. significant bat mortality). Operational mitigation for bat mortality consists of changing the wind turbine cut-in speed to 5.5 m/s (measured at hub height), or feathering of wind turbine blades when wind speeds are below 5.5 m/s.

The majority of bat mortalities from wind turbine operations occur during fall migration. Across North America, it is estimated that 90% of bat fatalities occur from mid-July through September. Where a post-construction monitoring annual report indicates the annual bat mortality threshold of 10 bats/turbine/year has been exceeded, operational mitigation will be implemented across the wind power project (i.e. at all turbines) from sunset to sunrise, from July 15 to September 30. This mitigation will continue for the duration of the project. Should site-specific monitoring

indicate a shifted peak mortality period, operational mitigation may be shifted to match the peak mortality, with mitigation maintained for a minimum 10 weeks. Any shift in the operational mitigation period to match peak mortality should be determined in coordination with and confirmed by MNR.

Where post-construction monitoring is applied, an additional 3 years of effectiveness monitoring is required. Monitoring the effectiveness of any post-construction mitigation techniques will help to evaluate the success of this mitigation.

3.3.2 Birds

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

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

For turbines located within 120m of bird SWH, immediate post-construction mitigation (including operational mitigation), as identified in the Environmental Impact Study, and 3 years of effectiveness monitoring will be required where monitoring identifies significant annual bird mortality or disturbance effects associated with bird SWH.

Operational mitigation techniques may include periodic shut-down of select turbines and/or blade feathering at specific times of the year when mortality risks to the affected bird species is particularly high (e.g. migration). Emerging and new technologies will be considered that may reduce bird fatalities.

3.4 CONTINGENCY PLANS

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

3.4.1 Bats

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

3.4.2 Birds

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

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

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

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

3.4.3 Species at Risk

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

3.5 Reporting and Review of Results

Data collected during post-construction monitoring will be submitted in accordance with MNR data standards and templates. Post-construction reports will be prepared and submitted as per Table 1.

Table 1: Schedule for post-construction monitoring reports detailing results of the Environmental Effects Monitoring Plan.

Monitoring Year	Report Submission Date
Year 1: May 1 – Nov 30, 2014	February 2015
Year 2: May 1 – Nov 30, 2015	February 2016
Year 3: May 1 – Nov 30, 2016	February 2017

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

All bat and bird monitoring data and associated reports will be submitted to the Ministry of the Environment and MNR, consistent with MNR’s procedures and protocols, and satisfy the data standards and requirements of the Wind Energy Bird and Bat Monitoring Database (see Appendix 1 for data template). Bat survey data submitted will be entered into the database, analyzed, reported and used to address knowledge gaps and create public data summaries. Standardized templates available online through the Wind Energy Bird and Bat Monitoring Database found at http://www.bsc-eoc.org/birdmon/wind/wind_templates.jsp will be used to record and report all field data.

Reports will also include maps of areas searched for each surveyed turbine and raw data for all carcass searches, searcher efficiency trials and carcass removal trials will be required as part of the annual report. A data sheet sample will also be provided with the mortality report.

A summary of when information about a particular mortality event or threshold is reported to Ministry of natural Resources is included in Table 2.

Table 2: Timeline for reporting mortality to Ministry of Natural Resources.

Mortality Threshold	How mortality is calculated	Reporting Timeline for Results
10 bats / turbine / year	Based on calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 2.
14 birds / turbine / year	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR as outlined in Table 2.
10 birds / turbine	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
33 birds (including raptors) at any multiple turbines	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection
0.2 raptors / turbine / year (all raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
0.1 raptors / turbine / year (provincially tracked raptors) across a wind power project	Based on annual calculation described in section 4.2.6 and applying the following formula $C = c / (S_{e0} \times S_c \times P_s)$	Results to be submitted annually to MNR within 3 months of completing mortality monitoring for birds and bats.
Endangered and Threatened Species	Single event as observed in the field during monitoring	Mortality event to be reported to MNR within 48 hours of detection.

4.0 Closure

This Environmental Effects Monitoring Plan for the Suncor Energy Cedar Point Wind Power Project has been prepared in accordance with O. Reg. 359/09, s. 23.1, the MNR's *Approval and Permitting Requirements Document for Renewable Energy Projects* (September 2009), the MOE's *Technical Guide to Renewable Energy Approvals*, MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

Stantec Consulting Ltd. prepared this Environmental Effects Monitoring Plan for Suncor Energy Products Inc. for the Suncor Energy Cedar Point Wind Power Project. Suncor is committed to implementing the appropriate protection and mitigation measures as they apply to the construction and operation of the proposed Project.

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5.0 References

- Bird Studies Canada. 1994. Marsh Monitoring Program Protocol.
- Environment Canada. 1997. Amphibian Road Call-Counts Participants Manual.
- Environment Canada. 2007. Wind Turbines and Birds - A Guidance Document for Environmental Assessment. 46 pp.
- Friesen, L. 2011. No evidence of large-scale fatality events at Ontario wind projects in *Ontario Birds*, Volume 29, No. 3, December 2011: pages 149- 155.
- Ontario Ministry of Natural Resources. 2006. Wind Turbines and Bats: Bat Ecology Background Information and Literature Review of Impacts. December 2006.
- Ontario Ministry of Natural Resources. 2007. Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats (Working Draft). 28 pp.
- Ontario Ministry of Natural Resources. 2009. Approval and Permitting Requirements Document for Renewable Energy Projects. 64 pp.
- Ontario Ministry of Natural Resources. 2010. Technical Bulletin Two: Guidance for preparing the Design and Operations Report (draft). 41 pp.
- Ontario Ministry of Natural Resources. 2011a. Birds And Bird Habitats: Guidelines For Wind Power Projects. 32 pp.
- Ontario Ministry of Natural Resources. 2011b. Bats And Bat Habitats: Guidelines For Wind Power Projects. 25 pp.
- Ontario Ministry of Natural Resources. 2012. Draft Significant Wildlife Habitat Ecoregion 7E Criterion schedule (Online). Available: <http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTE1ODc5&statusId=MTczNDgy&language=en>
- Penna, M., H. Pottstock and N. Velasquez. 2005. Effect of natural and synthetic noise on evoked vocal responses in a frog of the temperate austral forest. *Animal Behaviour* 70: 639-651.
- Sun, W.C., and P.M. Narins. 2004. Anthropogenic sounds differentially affect amphibian call rate. *Biological Conservation* 121:419-427.