



**WOLFE ISLAND ECOPOWER®  
CENTRE**

**POST-CONSTRUCTION FOLLOW-  
UP PLAN  
BIRD AND BAT RESOURCES**

MONITORING REPORT NO. 1  
MAY - JUNE 2009

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Prepared For:

**Canadian Hydro Developers, Inc.'s  
wholly owned subsidiary**

**Canadian Renewable Energy  
Corporation**

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## Executive Summary

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This report contains the results of the post-construction monitoring program for bird and bat resources at the Wolfe Island EcoPower Centre for the period between May 7 and June 30, 2009 (the “Reporting Period”). The Wolfe Island EcoPower Centre is a 197.8 megawatt (“MW”) wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario. Eighty-six 2.3 MW wind turbine generators (“WTGs”) and ancillary facilities have been placed over the western portion of Wolfe Island with additional supporting electrical infrastructure on the Kingston mainland.

During the Reporting Period, the wind plant was being commissioned with WTGs coming on-line on a daily basis. Consistent with the schedule for post-construction monitoring outlined in Section 5.1 of the Post-Construction Follow-up Plan for Bird and Bat Resources (the “Follow-up Plan”), field surveys conducted during the Reporting Period included:

- bird mortality monitoring
- bat mortality monitoring

Mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent consulting firm, according to a schedule and methods prepared by Stantec that were based on the Follow-up Plan. In addition to carcass searches, trials to determine various corrective factors for searcher efficiency and scavenging rates were conducted during the Reporting Period.

A total of nine carcasses of seven bird species were collected during the Reporting Period. All species have provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario) or S4 (i.e., Apparently Secure – uncommon but not rare). One species, Canada Warbler, has been recommended for “Threatened” designation by the federal Committee on the Status of Endangered Wildlife in Canada (“COSEWIC”), however, it currently has no status under the federal Species at Risk Act. The Ontario Ministry of Natural Resources added the Canada Warbler to its Species at Risk in Ontario list as a species of Special Concern on September 11, 2009, however at the time of writing, this species carried no provincial designation. Given the date of recovery (May 26), it is likely that this single fatality was of a migrating individual.

Two species, Wilson’s Snipe and Bobolink, experienced two fatalities each over the Reporting Period. Both species have aerial display flights during the breeding season, and were identified as potentially at higher risk of collision with WTG blades in the Project’s Environmental Review Report (“ERR”). An Eastern Kingbird fatality was also encountered; this species, as well as Canada Warbler and Bobolink, have been identified as species of conservation priority by Ontario Partners in Flight (2006). No raptor fatalities were noted during the Reporting Period.

A total of nine carcasses of three bat species were collected during the Reporting Period. The little brown bat (three fatalities) and big brown bat (one fatality) have provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario). The hoary bat (three fatalities) is ranked S4 (i.e., Apparently Secure – uncommon, but not rare). Two bat carcasses were in a very advanced state of decomposition and could therefore not be identified to species.

No fatalities were noted at either of the meteorological towers. An apparent clustering of fatalities in the northwest portion of the wind plant is an artefact of the commissioning schedule. WTGs in this portion of the wind plant were the first commissioned, and were the subject of carcass searches over much or all of the Reporting Period, whereas searches at WTGs with later commissioning dates were conducted over a shorter time period.

Currently, as documented in the Follow-up Plan, Environment Canada and the Canadian Wildlife Service recommend the following correction formula:

**C = c / (Se x Sc x Ps),** where

**C** is the corrected number of bird or bat fatalities

**c** is the number of carcasses found

**Se** is the proportion of carcasses expected to be found by searchers (searcher efficiency)

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

**Ps** is the percent of the area searched.

Individual searcher efficiency ranged from 55% to 70%. The overall, weighted searcher efficiency (Se) for the Reporting Period was calculated as 63.2%. The average proportion of a 50 m radius search area that was physically searched (Ps) during the Reporting Period was 81%.

The June 2009 scavenger trial was complicated during the commissioning period by inadvertent trial carcass displacement or removal by widespread commissioning and construction activities. Accordingly, the trial data were analyzed to account for all carcass removal, both from scavengers and from commissioning and construction activities. Analysis of the scavenger trial indicates that 39.5% of trial carcasses were not removed by scavengers or through construction and commissioning activities over the average search interval (Sc). This correction factor value is only applicable to the Reporting Period, and should not be applied to any subsequent monitoring period, as it takes into account carcasses removed through the construction and commissioning activities under WTGs.

Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the nine recovered bird carcasses and the nine recovered bat carcasses represent

approximately 45 bird fatalities and 45 bat fatalities over the Reporting Period. These values cannot be extrapolated to provide annual mortality rates (either per WTG or per MW), and therefore should not be compared to mortality rates at other wind facilities in North America, for the following reasons:

- During the Reporting Period, WTGs may not have been fully operational for entire search interval due to commissioning or maintenance activities.
- A variable number of WTGs were searched across the period. Few WTGs were searched early in the reporting period, and coverage of the full wind plant was not achieved until after the conclusion of the Reporting Period.
- Search intervals over the Reporting Period were irregular as a result of commissioning and construction activities (e.g., there were several occasions where WTGs were not searched on their scheduled days for safety reasons, commissioning activities, and/or access issues).
- There was more uncertainty than usual in determining the correction factor for carcass removal by scavengers and by construction activities, partly due to the irregular search intervals and also because the scavenger and construction/commissioning removal factor calculated for the trial period may not be representative of the entire reporting period.

Consequently, given the variables encountered during the Reporting Period, a conservative approach has been implemented, particularly with respect to the corrective factor for carcass removal. As a result, the estimated mortality numbers represent maximum numbers of fatalities for the Reporting Period.

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## 1.0 Introduction

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### 1.1 PROJECT OVERVIEW

Canadian Hydro Developers, Inc. (“Canadian Hydro”), through its wholly owned subsidiary Canadian Renewable Energy Corporation, has developed a 197.8 MW wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario. Eighty-six 2.3 MW WTGs and ancillary facilities have been placed over the western portion of Wolfe Island (**Figure 1, Appendix A**) with additional supporting electrical infrastructure on the Kingston mainland.

BirdLife International, in cooperation with Bird Studies Canada and Nature Canada, has identified Wolfe Island as an Important Bird Area (“IBA”) due to the presence of globally and continentally significant numbers of “congregatory” waterfowl species that gather offshore during the spring migration (information is available at [www.bsc-eoc.org/iba/site.jsp?siteID=ON037](http://www.bsc-eoc.org/iba/site.jsp?siteID=ON037)). In addition, Wolfe Island supports notable landbird populations (albeit not in numbers of global or continental importance) including wintering raptors and Tree Swallows.

The high quality grassland habitat that attracts wintering raptors also supports a high abundance and diversity of grassland breeding bird species of conservation priority (Cadman et al., 2007; Ontario Partners in Flight, 2006). As discussed in Section 7.9.1 of the ERR, Wolfe Island is a Category 4 Level of Concern Project from the perspective of bird use, based on criteria provided in Environment Canada’s *Wind Turbines and Birds: A Guidance Document for Environmental Assessment* (April, 2007a).

Wolfe Island would be a Sensitivity Rating 3 (High) project for bats based on the criteria provided in the Ontario Ministry of Natural Resources *Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats* (August 2007). Potential concerns with bats are generally associated with the Project’s proximity to the shoreline of Lake Ontario, which could potentially act as a corridor or channeling feature for migrating bats.

Recognizing the IBA designation related to waterfowl, as documented in the Project’s ERR, and the importance of the area to wintering raptors and breeding grassland birds, extensive primary pre-construction data were collected through multiple-year bird and bat baseline studies on Wolfe Island. These data were further augmented with secondary data from published and unpublished sources to generate a robust data set from which to assess the potential effects of the Project during its operation phase.

The potential bird and bat effects and associated mitigation measures, based upon this dataset, ornithological advice, and professional opinion, among other factors, are provided in ERR Section 7.9. Additionally, bird and bat post-construction monitoring commitments are provided in ERR Section 9.4. These commitments provide the first step of confirming the ERR predictions of potential effects and provide the basis from which the need for mitigative actions, if any, may be determined.

## **1.2 POST-CONSTRUCTION FOLLOW-UP PLAN**

A formal Post-Construction Follow-up Plan for Bird and Bat Resources (“Follow-up Plan”) was developed among Canadian Hydro, Environment Canada / Canadian Wildlife Service, the Ontario Ministry of Natural Resources, Natural Resources Canada, and Ducks Unlimited Canada (collectively the “parties”) in consideration of the unique features of Wolfe Island. The final Follow-up Plan was posted to Canadian Hydro’s website in May, 2009 following a period of public comment on a draft Follow-up Plan.

The objective of the Follow-up Plan was to set out the methods used to assess the direct and indirect effects of the 86 WTGs on the birds and bats of Wolfe Island and, if necessary, to implement appropriate measures to mitigate adverse environmental effects so they do not become significant. The Follow-up Plan was designed by the parties to achieve all of the provincial and federal commitments and requirements.

The Follow-up Plan is to be fully implemented upon commencement of commercial operations. The implementation of the Follow-up Plan will test the predictions of the EA reports prepared in accordance with the Ontario *Environmental Assessment Act* and the Canadian *Environmental Assessment Act*. Should any unanticipated adverse environmental effects be identified, it is the goal of the Follow-up Plan to mitigate those effects such that they do not become significant.

## **1.3 MONITORING REPORT OVERVIEW**

The Follow-up Plan specifies bi-annual post-construction monitoring reporting for periods ending June 30 and December 31. This report, the first in a series, contains the results of the post-construction monitoring program for the period between May 7 and June 30, 2009 (the “Reporting Period”). During this period, the wind plant was being commissioned with WTGs coming on-line on a daily basis. The plant achieved commercial operation on June 26, 2009, however all 86 WTGs had completed their commissioning works by June 29. With intermittent and periodic turbine shutdown to allow for ‘fine-tuning’ maintenance work, the first full week of operation of all 86 WTGs was the week of July 6, 2009.

Consistent with the schedule for post-construction monitoring outlined in Section 5.1 of the Follow-up Plan, field surveys conducted during the Reporting Period included:

- bird mortality monitoring
- bat mortality monitoring.



Surveys designed to assess disturbance effects to birds from operating WTGs, as described in Section 2.2 of the Follow-Up Plan, will commence in the fall of 2009 since the construction phase of the Project was on-going during the breeding bird season in 2009. The schedule for commencement of each survey type is summarized below.

Aerial Waterfowl Surveys	Fall 2009
Inland Waterfowl Foraging Surveys	Fall 2009
Winter Raptor Use Surveys	Winter 2009
Waterfowl Pairs Surveys	May 2010
Grassland Point Counts and Area Searches	June 2010
Wetland Point Counts and Area Searches	June 2010
Woodland Point Counts and Area Surveys	June 2010

## 2.0 Methods

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### 2.1 FIELD SURVEYS

Mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent consulting firm. Their activities were carried out according to a schedule and methods prepared by Stantec that were based on the Follow-up Plan.

The Follow-up Plan specifies that carcass searches are to be conducted at half the WTGs twice per week and at the other half once per week; the two groups shall be rotated so that one week the subset of WTGs receives the less intensive treatment, and the next week the more intensive treatment. Prior to the start of carcass searches, a schedule was prepared to ensure all turbines received the appropriate coverage (**Appendix C**).

During the Reporting Period, new WTGs were commissioned on a daily basis, and were in variable operation as commissioning activities proceeded to conclusion. WTGs were searched for carcasses on their scheduled day if blades were turning on that day, even if the WTG had not been operational for the full search interval prior to the search. As a result, during the Reporting Period, the number of WTGs searched once per week did not always match the number of WTGs searched twice per week. WTG carcass search efforts are summarized for the Reporting Period by week in **Table 1 (Appendix B)**.

Carcass searches for birds and bats were conducted at operating WTGs on weekdays during the Reporting Period, consistent with the Follow-Up Plan. Carcass searches were not conducted under hazardous weather conditions (e.g., thunder and lightning), or when construction or commissioning activities prevented access or presented a safety concern. A complete summary of survey dates, times, and weather conditions is provided in **Appendix D**.

The carcass searches consisted of one surveyor searching clear or minimally-vegetated portions (as recommended by Environment Canada [2007b]) of a 60 m radius area under each WTG, walking concentric transects spaced at 7 m intervals starting at 2 m from the turbine base. The search area radius and the locations of the transects at each WTG were determined using laser rangefinders with an accuracy of  $\pm 1$  m.

If a bird or bat carcass was discovered, the following information was recorded:

- date and time it was found
- state of decomposition
- estimated number of days since death
- injury sustained (or best estimate if the carcass was in poor condition)
- species (or best estimate if the carcass was in poor condition)
- distance and direction from the nearest WTG
- substrate where the carcass was found.

Carcasses were photographed, collected, and transported to an on-site freezer by Wolfe Island Wind Monitoring for confirmation of species by Stantec, if necessary. Those that were found in reasonable condition were kept for later use in searcher efficiency trials.

## **2.2 CORRECTION FACTORS AND DATA ANALYSIS**

Considering searcher efficiency and scavenger rates, it is assumed that some bird and bat carcasses are missed during the searches. Birds and bats that strike a moving wind turbine blade may be flung away from the turbine search area, removed by scavengers, or carcasses may be overlooked due to local conditions (e.g., tall grass). Therefore, information to calculate various corrective factors for searcher efficiency and scavenging rates was also collected during the Reporting Period.

There are numerous published and unpublished approaches to incorporating these corrective factors into an overall assessment of total bird and bat mortality. Currently, as documented in the Follow-up Plan, Environment Canada and the Canadian Wildlife Service recommend the following correction formula:

$$C = c / (Se \times Sc \times Ps), \text{ where}$$

**C** is the corrected number of bird or bat fatalities

**c** is the number of carcasses found

**Se** is the proportion of carcasses expected to be found by searchers (searcher efficiency)

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

**Ps** is the percent of the area searched.

### **2.2.1 Searcher Efficiency**

Searcher efficiency trials are designed to correct for carcasses that may be overlooked by surveyors during the survey periods. Searcher efficiency varies for each individual based upon their own unique characteristics.

During the Reporting Period, searcher efficiency trials involved a “tester” that placed bat carcasses under WTGs prior to the standard carcass searches over a period of several weeks between June 3 and June 30, 2009 to test each searcher’s detection rate. The trials involved 20 test bat carcasses for each of the three searchers. Bat carcasses were used because they are representative of the smallest animals (birds or bats) that are likely to be encountered during carcass searches. As well, because of their colouring, bat carcasses are representative of the most camouflaged animals (birds or bats) that may be encountered. For these reasons, the use

of bat carcasses for searcher efficiency trials provides a conservative approach to correcting for bird mortality, and an appropriate approach to correcting for bat mortality.

Searcher efficiency is expressed as a proportion of unscavenged carcasses found by individual searchers. Searcher efficiency ( $Se$ ) was calculated for each searcher as follows:

$$Se = \frac{\text{number of test carcasses found}}{\text{number of test carcasses placed} - \text{number of test carcasses removed by scavengers}}$$

### 2.2.2 Scavenger Trials

Scavenger trials are designed to correct for carcasses that are removed by predators before the search period. These trials involve the distribution of carcasses in known locations at each WTG, followed by periodic checking to determine the rate of removal.

During the Reporting Period, one two-week scavenger trial was conducted at 38 operational WTGs. As recommended by Environment Canada (2006b), two dead, dark-coloured chicks were placed in two locations within the 60 m search radius around each of the 38 WTGs. If there was more than one substrate type (e.g., gravel, hay, crop, or ploughed soil), the two chicks were placed on different substrates. UTM coordinates were taken at each chick location and the distance and direction from the WTG was measured.

Chick carcasses were placed on June 15, 2009, with their presence or absence recorded during regularly-scheduled carcass searches over the next two weeks. Proportions of carcasses remaining after each search interval are pooled to calculate the overall scavenger correction ( $Sc$ ) factors as follows:

$$Sc = \frac{n_{\text{visit1}} + n_{\text{visit2}} + n_{\text{visit3}}}{n_{\text{visit0}} + n_{\text{visit1}} + n_{\text{visit2}}}, \text{ where}$$

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

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

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

### 2.2.3 Percent Area Searched

Environment Canada has indicated that 85-88% of carcasses fall within 50 m of a WTG base (C. Francis, pers. comm., January 2008). Environment Canada (2007b) also specifies that for a WTG of the size as those on Wolfe Island, most bat carcasses fall within 50 m. Furthermore, it is generally agreed in the literature that the density of carcasses decreases with distance from the WTG base (e.g., Jain et al., 2007; Kerns et al., 2005 [as cited in Arnett et al., 2008]). Although carcass searches were conducted in clear or minimally-vegetated areas within a 60 m radius of the WTG base, the density of carcasses (i.e., the number of carcasses per unit area searched) is expected to be much lower between 50 m and 60 m from the WTG compared to those areas closer to the WTG. Calculation of the percent area searched based on a 60 m radius circle incorrectly assumes an even distribution of carcasses within this area, and could therefore lead to overestimation of mortality.

Accordingly, and to be comparable to the results of post-construction monitoring reported for other Ontario facilities, the percent area searched was calculated based on a 50 m radius circle, consistent with the Follow-Up Plan.

Near the beginning of the commissioning period, searchers filled out a 60 m radius circle diagram with 5 m x 5 m grid cells for each WTG, sketching areas searched and identifying areas that could not be searched due to vegetation cover or other factors. The area searched was determined for each WTG by counting the number of searched grid cells within 50 m, and dividing the summed area of those cells by the total area within a 50 m radius circle to determine the percent area searched for that turbine ( $Ps_x$ , where x is the turbine number).

$$Ps_x = \frac{\text{area searched within 50 m radius circle}}{7854 \text{ m}^2}$$

The overall  $Ps$  for the facility during the search period was calculated as the average of  $Ps_1$  through  $Ps_{86}$ .

## 3.0 Results

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### 3.1 CORRECTION FACTORS

#### 3.1.1 Searcher Efficiency

Individual searcher efficiency during the Reporting Period ranged from 55% to 70% (**Table 2, Appendix B**). The overall searcher efficiency was subsequently calculated by weighting the individual searcher efficiencies according to the proportion of WTGs surveyed by each individual over the Reporting Period. The overall, weighted searcher efficiency for the Reporting Period was calculated as 63.2% (**Table 2, Appendix B**).

#### 3.1.2 Scavenger and Other Removal Factors

The June 2009 scavenger trial was complicated during the commissioning period by inadvertent trial carcass displacement or removal by widespread commissioning and construction activities, such as increased truck traffic, site reclamation, grading, and access road width adjustment. Where possible, field crews noted where a scavenger trial carcass absence was likely due to construction activities. However, it was not possible to be absolutely certain of the agent of carcass removal.

It is apparent that the same complicating factors applicable to the detection of trial carcasses are also applicable to detection of actual fatalities. Accordingly, the trial data were analyzed to account for all carcass removal, both from scavengers and from commissioning and construction activities.

Analysis of the June 2009 scavenger trial indicates that 39.5% of trial carcasses were not removed by scavengers or through construction and commissioning activities over the average search interval (**Appendix E**). Although it has been assumed that the two-week scavenger trial results are representative of the eight-week Reporting Period, it is possible that there was a higher level of commissioning and construction activity at the end of the period (e.g. when the trial was conducted) as more WTGs were on-line, resulting in a more conservative, or lower estimate of the proportion of carcasses remaining, and a correspondingly higher estimate of mortality.

It is important to note that this correction factor value is only applicable to the Reporting Period, and should not be applied to any subsequent monitoring period, as it takes into account carcasses removed through the construction and commissioning activities under WTGs. Additional scavenger trials will be undertaken during the next reporting period in accordance with the schedule outlined in the Follow-Up Plan.

### 3.1.3 Percent Area Searched

The average proportion of the 50 m radius search area that was physically searched during the Reporting Period was 81%.

## 3.2 MORTALITY MONITORING

Raw mortality data for the Reporting Period is provided in **Appendix F**.

An Incidental Avian and Bat Observation Form is available on the Project website to receive comments from the public regarding bird and bat observations related to wind plant operations. No comments were received from the public during the Reporting Period.

### 3.2.1 Birds

A total of nine carcasses of seven bird species were collected during the Reporting Period. A summary is presented in **Table 3 (Appendix B)**. All species have provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario) or S4 (i.e., Apparently Secure – uncommon but not rare).

One species, Canada Warbler, has been recommended for “Threatened” designation by the federal Committee on the Status of Endangered Wildlife in Canada (“COSEWIC”), however, it currently has no status under the federal *Species at Risk Act*. The Ontario Ministry of Natural Resources added the Canada Warbler to its Species at Risk in Ontario list as a species of Special Concern on September 11, 2009, however at the time of writing, this species carried no provincial designation. Given the date of recovery (May 26), it is likely that this single fatality was of a migrating individual.

The remaining species are likely resident breeding birds. Two species, Wilson’s Snipe and Bobolink, experienced two fatalities each over the Reporting Period. Both species have aerial display flights during the breeding season, and were identified as potentially at higher risk of collision with WTG blades in the ERR. No other carcasses of species with aerial flight displays were recovered during the reporting period.

One fatality was noted of each of Canada Warbler (a species of forest habitat), Common Yellowthroat, Purple Martin, Tree Swallow, and Eastern Kingbird. Canada Warbler, Bobolink and Eastern Kingbird have been identified as species of conservation priority by Ontario Partners in Flight (2006). No raptor fatalities were noted during the Reporting Period.

Two of the nine fatalities occurred at WTG 15. The apparent clustering of fatalities in the northwest portion of the wind plant is an artefact of the commissioning schedule. WTGs 1-28 were the first commissioned, and were the subject of carcass searches over much or all of the Reporting Period, whereas searches at WTGs with later commissioning dates were searched

over a shorter time period. No fatalities were noted at either of the meteorological towers. All fatalities were observed within 37 m of the WTG.

Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the nine recovered carcasses represent approximately 44.5 bird fatalities (“C”) over the Reporting Period:

Period	c	Se	Sc	Ps	number of bird fatalities
May 7-June 30	9	0.632	0.395	0.81	44.5

**3.2.2 Bats**

A total of nine carcasses of three bat species were collected during the Reporting Period. A summary is presented in **Table 4 (Appendix B)**. The little brown bat (three fatalities) and big brown bat (one fatality) have provincial S-Ranks of S5 (i.e., Secure – common, widespread and abundant in Ontario). The hoary bat (three fatalities) is ranked S4 (i.e., Apparently Secure – uncommon, but not rare). Two bat carcasses were in a very advanced state of decomposition and could therefore not be identified to species.

As with the bird mortality observations, an apparent clustering of fatalities in the northwest portion of the wind plant is an artefact of the commissioning schedule. No fatalities were noted at either of the meteorological towers. All fatalities were observed within 43 m of the WTG.

Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the nine recovered carcasses represent approximately 44.5 bat fatalities (“C”) over the Reporting Period:

Period	c	Se	Sc	Ps	number of bat fatalities
May 7-June 30	9	0.632	0.395	0.81	44.5



### **3.3 NOTIFICATIONS**

Section 3.2 of the Follow-up Plan outlines mortality thresholds which trigger contact with Environment Canada / Canadian Wildlife Service, the Ontario Ministry of Natural Resources, and Natural Resources Canada. There were no notifications filed during the Reporting Period.

## 4.0 Discussion

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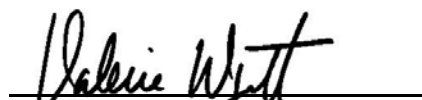
Correcting for searcher efficiency, scavenger and construction/commissioning removal rates, and percent area searched, it is estimated that approximately 45 bird and 45 bat fatalities were attributable to the WTGs during the Reporting Period. These values cannot be extrapolated to provide annual mortality rates (either per WTG or per MW), and therefore should not be compared to mortality rates at other wind facilities in North America, for the following reasons:

- During the Reporting Period, WTGs may not have been fully operational for entire search interval (e.g., operating WTGs were searched even if they were shut down for some of the search interval due to commissioning or maintenance activities).
- A variable number of WTGs were searched across the period. Few WTGs were searched early in the reporting period, and coverage of the full wind plant was not achieved until the week of July 6, 2009 (i.e., after the conclusion of the Reporting Period).
- Search intervals over the Reporting Period were irregular as a result of commissioning and construction activities (e.g., there were several occasions where WTGs were not searched on their scheduled days for safety reasons, commissioning activities, and/or access issues).
- There was more uncertainty than usual in determining the correction factor for carcass removal by scavengers and by construction/commissioning activities, partly due to the irregular search intervals and also because the scavenger and other removal value calculated for the trial period may not be representative of the entire reporting period.

Consequently, given the variables encountered during the Reporting Period, a conservative approach has been implemented, particularly with respect to the corrective factor for carcass removal. As a result, the estimated mortality numbers represent maximum numbers of fatalities for the Reporting Period.

Based on the limited monitoring period and variable monitoring activities, and considering the ongoing commissioning works around the WTGs, it is not possible to provide a meaningful comparison between the results for this Reporting Period and the predictions of potential effects provided in the ERR. The predictions of potential effects to birds and bats, as outlined in the ERR, were based on the premise of a fully operational wind plant.

**STANTEC CONSULTING LTD.**

  
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Valerie Wyatt, M.Sc.  
Senior Project Manager

## 5.0 References

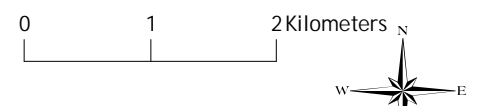
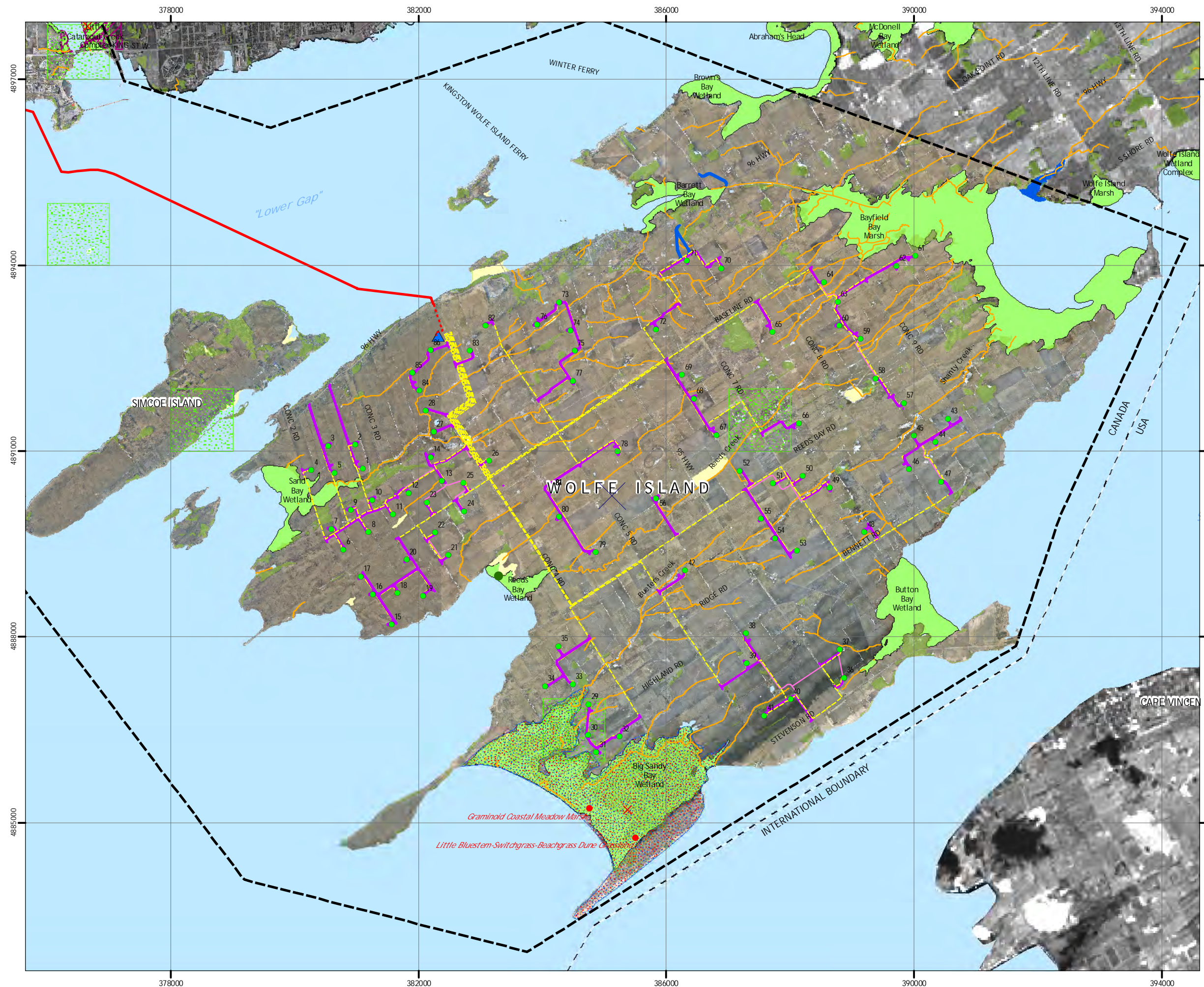
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# **Appendix A**

## **Figures**





Notes:  
 Base map layers: MNR Land Information Distribution Service (LIDS).  
 Air Photos: LIDAR (study area coverage), January 2006.  
 LANDSAT7 (U.S. coverage), 1999.  
 City of Kingston (city coverage), 2005.

Natural environmental features and hydrological data is from the Ministry of Natural Resources Peterborough District NRVIS 2006 and the Cataraqui Region Conservation Authority, 2006.

- Legend**
- Study Area
  - Gardiners Transformer Station
  - Turbine Layout
  - 230 kV Submarine Cable
  - 230 kV Transmission Line - Underground
  - Access Roads
  - 34.5 kV Collector Lines
  - 230 kV Substation / Operation & Maintenance Building
  - Temporary Road
  - Crane Walk Path
- Area of Natural or Scientific Interest (ANSI)**
- Earth
  - Life
- Wetlands**
- Provincially Significant Wetland
  - Non-Provincially Significant Wetland
  - Unevaluated Wetland
- Other Natural Areas**
- Earth Science Site
  - International Biological Program Site
  - Life Science Site
  - Vegetation Communities
  - Warm Water Streams
  - Cataraqui Region Conservation Authority Lands
  - Rare Species Occurrence
  - Woodlot

**WOLFE ISLAND ECOPOWER CENTRE  
 MONITORING REPORT NO. 1**  
 FIGURE NO.  
 1.0

# Wolfe Island Project Layout

FILE: 60960056\_ERR\_17.mxd PROJECT NUMBER: 60960056  
 REV. NO. 0 SHEET NO. 1 OF 1 SCALE: 1:60,000 DRAWN BY: AM



# **Appendix B**

## **Tables**

**Table 1: Scheduled Search Effort During Reporting Period\***

week of	May 7	May 11	May 18	May 25	June 1	June 8	June 15	June 22	June 29**
# turbines searched once/wk	4	8	4	14	13	25	25	41	35
# turbines searched twice/wk	0	6	8	15	16	13	25	28	34
total turbines searched	4	14	12	29	29	38	50	69	69

\* some turbine searches were not completed as scheduled due to construction/commissioning activities

\*\* includes scheduled search effort for June 29-July 3

**Table 2: Summary of Searcher Efficiency Trials During Reporting Period**

Searcher	number of carcasses placed	number of carcasses scavenged	number of carcasses found	Individual Se	number of turbine searches	proportion of turbine searches	Se x % turbines
1	20	0	14	0.70	120	0.317	0.222
2	20	0	11	0.55	161	0.425	0.234
3	20	1	13	0.68	98	0.259	0.177
<b>total</b>					<b>379</b>	<b>1.000</b>	<b>0.632</b>

**Table 3: Summary of Bird Fatalities, Reporting Period**

Species	Number of Fatalities	Turbine Number
Bobolink	2	16, 20
Canada Warbler	1	15
Common Yellowthroat	1	24
Eastern Kingbird	1	18
Purple Martin	1	12
Tree Swallow	1	45
Wilson's Snipe	2	15, 21

**Table 4: Summary of Bat Fatalities, Reporting Period**

<b>Species</b>	<b>Number of Fatalities</b>	<b>Turbine Number</b>
Big Brown Bat	1	26
Hoary Bat	3	2, 14, 48
Little Brown Bat	3	3, 25, 49
bat sp.*	2	4, 6

\*Two bat carcasses were in a very advanced state of decomposition and could therefore not be identified to species.



## **Appendix C**

### **Mortality Monitoring Schedule**

WEEK	SUBSET	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Subset A	4, (6, 7, 8, 9, 10, 11), 12, (13, 14), 21, 22, 26, (40, 41), 48, 52, (59, 60, 63), 66, 72, (79, 80, 81), 83, MET 1	(3, 5), (29, 30, 31, 32), 47, (53, 54, 55) 56, 58, (73, 74, 75, 76, 77).		4, (6, 7, 8, 9, 10, 11), 12, 21, 22, 26, (40, 41), 48, 52, (59, 60, 63)	(3, 5), (13, 14), (29, 30, 31, 32), 47, (53, 54, 55), 56, 58, 66, 72, (73, 74, 75, 76, 77), (79, 80, 81), 83, MET 1
	Subset B		(1, 2), 23, 27, 28, (43, 44, 45, 46)	24, 25, (33, 34, 35), 36, 37, (38, 39), 42, 49, 50 51, 57, 64, 65, (67, 68, 69), (70, 71), 78, 82, (84, 85, 86), MET 2	(15, 16, 17, 18, 19, 20), (61, 62)	

WEEK	SUBSET	Monday	Tuesday	Wednesday	Thursday	Friday
Week 2	Subset A		4, (6, 7, 8, 9, 10, 11), 12, 66	(3, 5), (13, 14), 21, 22, 26, (29, 30, 31, 32), (40, 41), 47, 48, 52, 56, 58, (59, 60, 63), 72, (79, 80, 81), 83, MET 1	(53, 54, 55), (73, 74, 75, 76, 77)	
	Subset B	(1, 2), 23, 24, 27, 28, (33, 34, 35), 36, 37, (38, 39), 42, (43, 44, 45, 46), 50, 64, 65, 78, 82, (84, 85, 86), MET 2	(15, 16, 17, 18, 19, 20), 25, 49, 51, 57, (61, 62), (67, 68, 69), (70, 71)		(1, 2), 23, 24, 27, 28, (33, 34, 35), 36, 37, (43, 44, 45, 46), (84, 85, 86)	(15, 16, 17, 18, 19, 20), 25, (38, 39), 42, 49, 50, 51, 57, (61, 62), 64, 65, (67, 68, 69), (70, 71), 78, 82, MET 2

# **Appendix D**

## **Survey Conditions**

<b>Survey Date</b>	<b>Weather</b>	<b>Start Time</b>	<b>End Time</b>
07-May-09	Temp: Wind: Cloud: 100% PPT: Drizzle Overnight ppt or fog:	10:40 AM	12:00 PM
11-May-09	Temp: Wind: Cloud: PPT: Overnight ppt or fog:	9:34 AM	12:55 PM
12-May-09	Temp: 14 Wind: 3 Cloud: 0% PPT: none Overnight ppt or fog: none	9:30 AM	4:26 PM
14-May-09	Temp: 10-14 Wind: 5 Cloud: 0 PPT: none Overnight ppt or fog:	4:15 PM	6:36 PM
15-May-09	Temp: 13 Wind: 2 Cloud: 100% PPT: none Overnight ppt or fog:	3:55 PM	4:34 PM
18-May-09	Temp: 6-10 Wind: 6 Cloud: PPT: none Overnight ppt or fog: none	9:20 AM	6:59 PM
19-May-09	Temp: 10-12 Wind: 4 Cloud: PPT: none Overnight ppt or fog: none	8:10 AM	5:18 PM
21-May-09	Temp: 18-24 Wind: 3 Cloud: 0 PPT: none Overnight ppt or fog: none	8:35 AM	6:20 PM
25-May-09	Temp: 12-14 Wind: 2-4 Cloud: 0% PPT: none Overnight ppt or fog: none	7:15 AM	2:59 PM
26-May-09	Temp: 13-16 Wind: 2-4 Cloud: 100% PPT: Overnight ppt or fog:	10:33 AM	5:05 PM
27-May-09	Temp: 12-13 Wind: 2-4 Cloud: 100% PPT: Steady rain Overnight ppt or fog:	1:15 PM	4:19 PM
28-May-09	Temp: 13-16 Wind: 3 Cloud: 100% PPT: Heavy rain Overnight ppt or fog: rain	10:15 AM	5:55 PM
29-May-09	Temp: 18 Wind: 3 Cloud: PPT: none Overnight ppt or fog:	5:35 PM	5:56 PM
1-Jun-09	Temp: 10 Wind: 2 Cloud: 100% PPT: none Overnight ppt or fog:	11:16 AM	3:53 PM
2-Jun-09	Temp: 11 Wind: 2 Cloud: 100% PPT: Overnight ppt or fog:	10:23 AM	12:12 PM
3-Jun-09	Temp: 13 Wind: Cloud: PPT: Overnight ppt or fog:	8:40 AM	10:30 AM
4-Jun-09	Temp: 15-18 Wind: 2-3 Cloud: PPT: none Overnight ppt or fog:	9:25 AM	4:45 PM
5-Jun-09	Temp: 18 Wind: Cloud: PPT: Overnight ppt or fog:	7:00 AM	11:00 AM
8-Jun-09	Temp: 13 Wind: 2 Cloud: PPT: Overnight ppt or fog:	7:10 AM	10:16 AM
9-Jun-09	Temp: 15 Wind: 3-4 Cloud: 100% PPT: Overnight ppt or fog:	10:23 AM	12:28 PM
10-Jun-09	Temp: 13 Wind: 2 Cloud: PPT: Overnight ppt or fog:	7:34 AM	12:45 PM
11-Jun-09	Temp: 19-22 Wind: 1-2 Cloud: 100% PPT: Overnight ppt or fog:	7:40 AM	4:00 PM
12-Jun-09	Temp: 18-22 Wind: 1-3 Cloud: 0-50% PPT: Overnight ppt or fog:	9:32 AM	4:16 PM

<b>Survey Date</b>	<b>Weather</b>	<b>Start Time</b>	<b>End Time</b>
15-Jun-09	<b>Temp: 20 Wind: 3 Cloud: PPT: Overnight ppt or fog:</b>	8:18 AM	12:00 PM
16-Jun-09	<b>Temp: 22 Wind: 3 Cloud: PPT: Overnight ppt or fog:</b>	7:45 AM	3:51 PM
17-Jun-09	<b>Temp: 20 Wind: 2-3 Cloud: PPT: Overnight ppt or fog:</b>	3:06 PM	5:53 PM
18-Jun-09	<b>Temp: 12-15 Wind: 2-3 Cloud: 100%PPT: Light rain Overnight ppt or fog:</b>	12:20 PM	4:32 PM
19-Jun-09	<b>Temp: 15-17 Wind: 2 Cloud: 100% PPT: Drizzle Overnight ppt or fog:</b>	9:32 AM	12:33 PM
22-Jun-09	<b>Temp: 22 Wind: 3 Cloud: PPT: Overnight ppt or fog:</b>	7:25 AM	1:34 PM
23-Jun-09	<b>Temp: 25-30 Wind: 3 Cloud: PPT: Overnight ppt or fog:</b>	7:03 AM	5:53 PM
24-Jun-09	<b>Temp: 25-30 Wind: 3 Cloud: PPT: Overnight ppt or fog:</b>	10:37 AM	4:35 PM
25-Jun-09	<b>Temp: 25 Wind: 3 Cloud: 100 % PPT: Overnight ppt or fog:</b>	10:15 AM	5:58 PM
26-Jun-09	<b>Temp: Wind: Cloud: PPT: Overnight ppt or fog:</b>	7:05 AM	12:54 PM
29-Jun-09	<b>Temp: 15-20 Wind: 3 Cloud: 100 % PPT: Overnight ppt or fog:</b>	7:25 AM	1:10 PM
30-Jun-09	<b>Temp: 18-20 Wind: 2-3 Cloud: 100 % PPT: Overnight ppt or fog:</b>	9:50 AM	3:39 PM

## **Appendix E**

### **Scavenger Trial Calculations**

<b>Turbine #</b>	<b>Visit 0</b>	<b>Visit 1</b>	<b>Visit 2</b>	<b>Visit 3</b>
1 A	1	1	0	0
1 B	1	1	0	0
10 A	1	1	0	0
10 B	1	0	0	0
11 A	1	1	0	0
11 B	1	0	0	0
12 A	1	0	0	0
12 B	1	0	0	0
13 A	1	0	0	0
13 B	1	0	0	0
14 A	1	0	0	0
14 B	1	0	0	0
15 A	1	1	1	1
15 B	1	1	1	1
16 A	1	0	0	0
16 B	1	0	0	0
17 A	1	1	0	0
17 B	1	1	1	1
18 A	1	1	1	0
18 B	1	1	0	0
19 A	1	1	0	0
19 B	1	0	0	0
2 A	1	0	0	0
2 B	1	1	0	0
20 A	1	1	1	1
20 B	1	0	0	0
21 A	1	0	0	0
21 B	1	0	0	0
22 A	1	1	0	0
22 B	1	0	0	0
23 A	1	0	0	0
23 B	1	0	0	0
24 A	1	1	0	0
24 B	1	1	0	0
25 A	1	1	0	0
25 B	1	1	0	0
26 A	1	0	0	0
26 B	1	0	0	0
27 A	1	0	0	0
27 B	1	0	0	0
28 A	1	0	0	0
28 B	1	0	0	0
3 A	1	1	1	0
3 B	1	0	0	0
4 A	1	0	0	0
4 B	1	0	0	0
48 A	1	1	1	0
48 B	1	0	0	0
49 A	1	0	0	0
49 B	1	1	0	0
5 A	1	1	1	0

Turbine #	Visit 0	Visit 1	Visit 2	Visit 3
5 B	1	1	1	0
50 A	1	1	0	0
50 B	1	0	0	0
51 A	1	0	0	0
51 B	1	0	0	0
52 A	1	0	0	0
52 B	1	0	0	0
53 A	1	1	0	0
53 B	1	1	0	0
54 A	1	1	0	0
54 B	1	0	0	0
55 A	1	1	0	0
55 B	1	0	0	0
56 A	1	0	0	0
56 B	1	0	0	0
6 A	1	1	0	0
6 B	1	0	0	0
7 A	1	1	0	0
7 B	1	0	0	0
8 A	1	0	0	0
8 B	1	1	0	0
83 A	1	1	1	0
83 B	1	1	0	0
9 A	1	0	0	0
9 B	1	0	0	0
	76	33	10	4

$$Sc = \frac{33+10+4}{76+33+10} = 0.3948$$



## **Appendix F**

### **Mortality Monitoring Results**

Date	Turbine #	GPS Location Zone Easting Northing	Observer	Species	Condition/Estimated Time Since Death	Injuries Sustained	Distance to Turbine (m)	Direction to Turbine	Ground Cover
19-May-09	6	18T 0380773 4889445	1	Bat sp.	Maggot infested/ 3+ days	Gravel indented in body	30	north	Gravel
26-May-09	15	18T 0381557 4888216	1	Canada Warbler	Newly dead/ 1 day	No visible trauma	14	west	Soil
28-May-09	16	18 T 0381270 4888705	2	Bobolink	Possibly scavenged-1-2 days	Unknown	16	southwest 224°	Gravel Road
3-Jun-09	25	18T 0382744 4890507	1	Little Brown Bat	Dessicated/ 5		22	northeast	Clay
3-Jun-09	24	18T 382726 4890070	1	Common Yellowthroat	Fresh/ <1 day	No visible trauma	37	northwest	Gravel
5-Jun-09	3	18T 0380512 4891060	1	Little Brown Bat	Dessicated/ 5		43	northeast 60°	Soil
9-Jun-09	15		2	Wilson's Snipe	1-2 days	Yes	11	northeast 24°	Soil
12-Jun-09	49	18T 30388634 4890420	1	Little Brown Bat	Fresh/ <2 days	Trauma to right side	12	north	Gravel
15-Jun-09	14	18 T 382168 4890921	1	Hoary Bat	Maggoty/ 1+ day	none evident	26	north	Gravel
16-Jun-09	2	18 T 0380970 4891090	2	Hoary Bat	No decomposition/<1 day		14	north-northeast	Soil
18-Jun-09	18	18 T 381654 4888714	2	Eastern Kingbird	Good/ 1-2 days		1	290°	Soil
18-Jun-09	21	18 T 382489 4889338	2	Wilson's Snipe	Old maggots/ 3 days		22	292°	Soil
18-Jun-09	48	18 T 389189 4889715	2	Hoary Bat	New/<1 day		30	170°	Gravel/Soil
23-Jun-09	20	18 T 381808 4889252	2	Bobolink	Fresh/<1 day	Neck	1	220°	Gravel
25-Jun-09	45	18 T 0390015 4891221	3	Tree Swallow	fresh/ 1-2 days	neck	35	320°	Gravel
29-Jun-09	4	18 T 0380261 4890702	3	Bat sp.	2-3 days		8	133°	Soil
29-Jun-09	12	18 T 0381834 4890339	2	Purple Martin	fresh/ 1-2 days	wings	15	30°	Gravel
29-Jun-09	26	18 T 0383065 4890835	2	Big Brown Bat	Fresh/<1 day	none evident	31	33°	Gravel