WOLFE ISLAND WIND PLANT

POST-CONSTRUCTION
FOLLOW-UP PLAN

BIRD AND BAT RESOURCES

MONITORING REPORT NO. 6
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Executive Summary

This report contains the results of the post-construction monitoring program for bird and bat resources at the Wolfe Island Wind Plant for the period between July 1 and December 31, 2011 (the "Reporting Period"). The Wolfe Island Wind Plant 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.

This report, the sixth in a series, contains the results of the post-construction monitoring program for the period between July 1 and December 31, 2011. The Wind Plant achieved commercial operation on June 26, 2009, and 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 Post-Construction Follow-Up Plan for Bird and Bat Resources for the Wolfe Island Wind Plant (revised February 2010) (the "Follow-up Plan"), field surveys conducted during the Reporting Period included:

- bird and bat mortality monitoring
- disturbance effects monitoring – staging and foraging migratory waterfowl
- disturbance effects monitoring – wintering raptors

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 37 carcasses of 20 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).) with the exception of European Starling which is ranked SNA (i.e., Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities).

Four Bobolink fatalities were observed during the Reporting Period. This species is listed as Threatened on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007).* Bobolink has been identified by COSEWIC as threatened, but has not been added to a

schedule of the *Species at Risk Act (200*2). Bobolink is also considered a species of conservation priority by Ontario Partners in Flight (2008). After applying correction factors for searcher efficiency, scavenger removal and percent area searched, the four carcasses found represent an estimated 26.0 Bobolink fatalities over the Reporting Period. The number of fatalities is small relative to the estimated 1,000-1,500 that were observed in the study area during pre-construction surveys (approximately 1,050 counted during area searches, plus others observed during point counts; Stantec, 2008) and the estimated Ontario population of 800,000 (Cadman et al., 2007).

Single fatalities of three other species of conservation priority by Ontario Partners in Flight (2008) were recorded over the Reporting Period, specifically Northern Flicker, Eastern Kingbird and Savannah Sparrow. This level of mortality is not considered to result in a measureable impact to the local, regional or provincial populations of these species.

Three Red-tailed Hawk fatalities were recorded over the course of this Reporting Period. When corrected for scavenger removal and percent area searched, the three recorded fatalities represent an estimated total raptor mortality rate of 0.09 raptors/turbine (0.04 raptors/MW) for the Reporting Period. The estimated mortality rate for all birds is 3.71 birds/turbine (1.61 birds/MW) for the Reporting Period. When combined with the results of the January to June 2011, the annual mortality rate can be estimated, and has been calculated to be 5.43 birds/turbine/year (2.35 birds/MW/year). This annual mortality rate is well below the adaptive management threshold of 11.7 birds/MW identified in the Follow-up Plan.

The annual bird mortality rate of 2.35 birds/MW is lower than that observed at the Maple Ridge, New York facility (5.81 birds/MW) in 2006 (Jain et al., 2007) and 2007 (3.82 birds/MW; Jain et al., 2009). The Maple Ridge facility is located approximately 75 km south of the Wolfe Island Wind Plant. The Wolfe Island mortality rates are within the mortality range of 0 birds/MW to approximately 14 birds/MW reported by The National Wind Coordinating Collaborative ("NWCC", Strickland et al., 2011) in their review of fatality rates at 63 North American wind facilities. When comparing numbers, it is important to note that most, if not all of the studies at Maple Ridge and those summarized in the NWCC report did not include winter mortality monitoring, and therefore any fatalities occurring over the winter months were not included in annual mortality rates. The data for the Wolfe Island Wind Plant includes winter fatalities.

When combined with the results of the January to June 2011 monitoring period, the annual raptor mortality rate can be estimated, and has been calculated to be 0.28 raptors/turbine/year (0.12 raptors/MW/year). The annual raptor and vulture mortality rate of 0.12 raptors/MW is within the mortality range observed at other facilities in North America outside California (0 – 0.49 raptors/MW; Strickland et al., 2011) and would rank 11th out of the 34 wind farms summarized outside of California. It is approximately half of the rate observed at Maple Ridge in 2007, (0.25 raptors/MW as reported by NWCC, Strickland et al., 2011).

A total of 52 carcasses of four bat species were collected during the Reporting Period. The Hoary Bat (26 fatalities), Eastern Red Bat (9 fatalities), and Silver-haired Bat (8 fatalities), are

classified as long-distance migratory tree bats and comprised 82.7% of all bat fatalities. The majority of bat mortality was spread between mid-July and the end of September, with no evident peak in fatalities. The other bat species recorded was the Big Brown bat (8 fatalities). One bat fatality was not identifiable to species because of its advanced state of decomposition.

Correcting for searcher efficiency, scavenger and other removal rates, and percent area searched, the 52 recovered carcasses represent an estimated bat mortality for the entire wind farm over the Reporting Period of 5.73 bats/turbine (2.49 bats/MW). When combined with the estimated mortality rate for the period January to June 2011 the annual bat mortality rates is estimated at 6.21 bats/turbine (2.70 bats/MW), well within the range of rates reported by NWCC (Strickland et al., 2011) and Arnett et al., (2007).

Although estimated bat mortality rates observed at the Wolfe Island Wind Plant have been below the adaptive management threshold of 12.5 bats/MW as identified in the Follow-Up Plan, TransAlta has proactively developed and implemented a research program to evaluate practical measures to reduce the effects of operating WTGs on bats at Wolfe Island. The bat mitigation research program, which was undertaken during the current Reporting Period, used operational controls on selected WTGs to prevent the blades from spinning during higher risk periods (i.e. night time hours under low wind conditions during the fall migration between July 15 and September 30). The research program aimed to compare bat mortality rates at two different wind cut-in speeds (the wind speed at which turbine blades begin to spin).

The bat mitigation research program was completed in conjunction with the regular mortality monitoring and utilized 42 of the 86 WTG's on Wolfe Island. The 42 WTG's, each searched twice per week, were randomly placed into three treatment subsets, including;

- Group A – 14 turbines controlled to a cut-in wind speed of 5.5 m/s from sunset to sunrise;
- Group B – 14 turbines controlled to a cut-in wind speed of 4.5 m/s from sunset to sunrise; and
- Group C – 14 turbines remained un-mitigated as a control for comparison.

Corrected for searcher efficiency, scavenger and other removal rates, and percent area searched, bat mortality rates were calculated separately for each of the treatment groups over the course of the research program. The corrected mortality estimate at Group C (un-mitigated) of 5.25 bats/turbine (2.28/MW) was approximately twice that observed at the mitigated Group A (5.5 m/s) and Group B (4.5 m/s) subsets, with respective mortality rates of 2.08 and 2.73 bats / turbine (0.91/MW and 1.19/MW). While the estimated mortality rates of the two mitigated groups were relatively low, WTG's in Group B, with the rotor cut-in at a wind speed of 4.5 m/s, had a slightly higher mortality rate than Group A WTG's with the rotor cut-in at a speed of 5.5 m/s. However, given the overall low number of bat fatalities observed during the research program, a statistical analysis of the results is not feasible at this time given the small sample size.

Total waterfowl days recorded by the aerial waterfowl surveys were similar in 1999, 2008 and 2009, with slightly lower numbers observed in 2010 and 2011. These lower numbers could be due to natural variability of migrant abundance and the uncertainty of sampling on a large scale. An overall 12% decrease in waterfowl days was observed between 2008 pre-construction and 2011 post-construction monitoring, well below the threshold of potentially significant decline as defined in the Follow-up Plan (i.e., 30%).

During the winter raptor surveys, maximum numbers observed during any one survey in 2011 for each species were 29 Short-eared Owls, 8 Snowy Owls, 22 Rough-legged Hawks, 16 Northern Harriers, 7 Red-tailed Hawks, 6 American Kestrels, 2 Bald Eagles and a single Turkey Vulture. Average raptor density, calculated as the number of raptors per kilometer of survey across the study area, was relatively similar on each of the four surveys in November and December 2011, ranging from 0.5 to 0.7 raptors per kilometer. During the evening surveys, Short-eared Owls density was more variable, with densities of 0.0, 0.4, 0.7 and 0.2 owls per kilometer for the November 7 and 23 and December 5 and 19 surveys, respectively.

Raptor numbers November and December 2011 were generally similar to those during the same period of the pre-construction surveys in 2006. Compared to the 2006 surveys, Northern Harriers and Red-tailed Hawks were less abundant in 2011, but Rough-legged Hawks and Snowy Owls were more abundant. Short-eared Owls were found to be particularly more abundant in November and December 2011, when compared to the same period in 2006. Trends observed through the 2006, 2009, 2010 and 2011 winter raptor monitoring on Wolfe Island generally correspond to results of the Kingston Christmas Bird Count in those years.

A more thorough discussion of raptor behavior, including an analysis of the complete winter season (November 2011-March 2012), will be provided in the subsequent Monitoring Report No. 7.

Following an analysis of the results from this Reporting Period, it is recommended that mortality and disturbance effects monitoring proceed in the January to June 2012 Reporting Period, in accordance with the Follow-up Plan.

During the 2011 operational mitigation trial relatively low numbers of bat fatalities were recorded. As a result of the small dataset, a thorough statistical analysis would not be feasible at this time. An additional year of operational mitigation trials (i.e. July 15 to September 30, 2012) is recommended to collect a larger dataset which may allow for a statistical comparison between the treatment groups.

Three years of fall monitoring have shown relatively consistent numbers of waterfowl staging offshore. As such, it is recommended that aerial survey of offshore staging areas be discontinued in 2012.

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1.0 Introduction

1.1 PROJECT OVERVIEW

TransAlta Corporation, through its wholly owned subsidiary Canadian Renewable Energy Corporation ("CREC"), 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 wind turbine generators ("WTGs") and ancillary facilities have been placed over the western portion of Wolfe Island (**Figure 1.0, 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). 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, 2008). As discussed in Section 7.9.1 of the Environmental Review Report ("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 CREC, 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 the Wolfe Island Project website in May, 2009 following a period of public comment on a draft Follow-up Plan.

The Follow-up Plan was subsequently revised to reflect site-specific findings available from the 2009 studies on Wolfe Island, and revised guidance materials available from the regulatory agencies. The revised Follow-up Plan (February, 2010) has been posted on TransAlta's Wolfe Island Wind Plant website at www.transalta.com/wolfeisland for stakeholder information. The previous version of the Plan (May, 2009), a summary of stakeholder comments received on the draft Follow-up Plan, and written notification of the revised Follow-up Plan are also available on the Project website.

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 was fully implemented upon commencement of commercial operations to test the predictions of the ERR 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 sixth in a series, contains the results of the post-construction monitoring program for the period between July 1 and December 31, 2011 (the "Reporting Period").

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 and bat mortality monitoring
- disturbance effects monitoring – offshore staging migratory waterfowl
- disturbance effects monitoring – wintering raptors

Pre and post-construction monitoring to date has shown stable numbers of geese and dabbling ducks foraging inland and unchanged movement patterns between foraging areas and offshore staging areas. As such, in consultation with the review agencies, surveys for disturbance effects monitoring for inland movement and foraging migratory waterfowl were discontinued in the fall of 2011.

Although estimated bat mortality rates observed at the Wolfe Island Wind Plant have been below the adaptive management threshold of 12.5 bats per MW as identified in the Follow-Up Plan, TransAlta has proactively developed and implemented a research program to evaluate practical measures to reduce the effects of operating WTGs on bats at Wolfe Island. The research includes operational control of selected turbines during night time hours under low wind conditions during the fall migration period (July 15 to September 30). The operational mitigation studies were implemented during the current Reporting Period with the results presented in this report.

2.0 Methods

2.1 MORTALITY MONITORING

2.1.1 Field Surveys

Mortality monitoring was carried out by employees of Wolfe Island Wind Monitoring, an independent, third party consulting firm based in Kingston Ontario. The firm and individual employees conducting the carcass searches have remained consistent since the start of the monitoring program in the spring of 2009. Their activities were carried out according to 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. To reduce some imprecision arising from the alternating carcass search schedule, one recommendation of Monitoring Report No. 2 (Stantec Consulting Ltd., May 2010) was to change to a search schedule in which one half the WTGs are searched twice weekly (3.5 day search interval) and the other half are searched once weekly (7 day search interval) without rotation. With agreement from the agencies, the latter approach was adopted starting at the beginning of May 2010. Mortality estimates were calculated separately for each treatment.

Due to the very low levels of scavenger removal and mortality observed over the winter months, one recommendation of Monitoring Report No. 3 was to reduce the frequency of the winter carcass searches in December, January and February. With agreement from the agencies, in the Reporting Period, all WTGs were searched once weekly (7 day search interval) from December 19-31, 2011.

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 maintenance or reclamation 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 50 m radius area under each WTG, walking concentric transects spaced at approximately 7 m intervals starting at 2 m from the WTG base. The search area radius and the locations of the transects at each WTG were determined using laser rangefinders with an accuracy of ±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 in which 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 or scavenger trials.

2.1.2 Correction Factors and Data Analysis

Information to calculate various corrective factors for searcher efficiency and scavenging rates was also collected during the Reporting Period. Correction factors were calculated to account for carcasses that fell in areas that were not searched as a result of dense vegetation, standing water or other obstacles, for carcasses that were overlooked, and for carcasses that were removed by scavengers prior to the search.

There are numerous published and unpublished approaches to incorporating these corrective factors into an overall assessment of total bird and bat mortality. As documented in the Follow-up Plan, Environment Canada, Canadian Wildlife Service and the Ministry of Natural Resources 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.

Correction factors for raptors and vultures are expected to be significantly different than those for small birds and bats, for the following reasons:

- searcher efficiency rates are higher than average for larger birds
- larger and heavier birds are more likely to land closer to the WTG
- scavenger rates are lower for larger birds as they are harder for scavengers to carry off. There is also some evidence from western North America that scavengers may have an aversion to the carcasses of large hawks (Strickland and Morrison, 2008).

As a result, Se was estimated to be 1.0 for raptors and vultures. An estimate of Sc for raptors and vultures was determined through July 2011, August 2011 and January 2012 scavenger trials using 5 raptor carcasses. Additionally, to account for the greater visibility of large birds such as raptors or vultures, separate estimation of Ps was undertaken (Section 2.1.2.3). Therefore, in calculating the total number of bird fatalities, raptor and vulture fatalities were corrected separately. The corrected number of raptor and vulture fatalities was added to the corrected number of other bird fatalities to obtain the total estimated number of bird fatalities:

$$\mathbf{C = (c_1 / (Se_1 \times Sc_1 \times Ps_1)) + (c_2 / (Se_2 \times Sc_2 \times Ps_2))},$$ where

C is the corrected number of bird fatalities

$\mathbf{c_1}$ is the number of raptor or vulture carcasses found

$\mathbf{c_2}$ is the number of other carcasses found

Se is the proportion of raptor/vulture carcasses ($\mathbf{Se_1}$) or other carcasses ($\mathbf{Se_2}$) expected to be found by searchers (searcher efficiency)

Sc is the proportion of raptor/vulture carcasses ($\mathbf{Sc_1}$) or other carcasses ($\mathbf{Sc_2}$) not removed by scavengers over the search period

Ps is the percent of the area searched for raptors/vultures ($\mathbf{Ps_1}$) or other carcasses ($\mathbf{Ps_2}$).

The total number of bird or bat fatalities was divided by the number of WTGs (i.e., 86) and the number of MW (i.e., 197.8) to obtain the estimated mortality rates by turbine and by MW for the Reporting Period. The mortality rate at the two MET towers would have been calculated separately, however no fatalities were observed at either MET tower throughout the Reporting Period.

2.1.2.1 Searcher Efficiency

Searcher efficiency trials are designed to correct for carcasses that may be overlooked by searchers during the survey periods. Environment Canada (2007b) provides detailed

recommendations on determining searcher efficiency, expressed as a proportion of carcasses expected to be found by individual searchers.

During the Reporting Period, searcher efficiency trials involved "testers" that placed carcasses under WTGs prior to the standard carcass searches over the period July 1 to December 21 to test each searcher's detection rate. The trials involved between 20 and 23 test bird and bat carcasses for each of the full time searchers and between 13 to 27 test birds and bats for each of the part time searchers.

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

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

Because searchers surveyed varying numbers of WTGs over the course of the mortality monitoring, it was necessary to find a weighted average which reflected the proportion of WTGs each searcher surveyed. This weighted average, or overall Se, was calculated as follows:

$$Se_o = Se_1(n_1/T) + Se_2(n_2/T) + Se_3(n_3/T) + Se_4(n_4/T)$$

where:

Se_o	is the overall searcher efficiency;
$Se_1 – Se_4$	are individual searcher efficiency ratings;
$n_1 – n_4$	is quantity of search days completed by each searcher; and
T	is the total number of search days completed by all searchers.

2.1.2.2 Scavenger Trials

Scavenger trials are designed to correct for carcasses that are removed by scavenging animals 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, three two-week scavenger trials were conducted during the months of July, August and September. Additionally, the results of a January/February 2012 scavenger trial were applied to the results of the December, 2011 surveys.

Two dead, native bird and bat carcasses were placed in two locations within the 50 m search radius at 20 WTGs during the July, August and September trials. Single carcasses were placed

at each turbine during the January/February trial. UTM coordinates were taken at each trial carcass location and the distance and direction from the WTG were measured.

Trial carcasses were placed on July 18, August 22 and September 19, 2011, and January 30, 2012, with their presence or absence recorded during regularly-scheduled carcass searches over the subsequent two weeks. Proportions of carcasses remaining after each search interval were pooled to calculate the overall scavenger correction (Sc) factors as follows:

$$Sc = \frac{n_{visit1} + n_{visit2} + n_{visit3} + n_{visit4,}}{n_{visit0} + n_{visit1} + n_{visit2} + n_{visit3}}$$ where

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

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

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

Sc is expected to vary with the length of the search interval, i.e., the proportion of carcasses not removed by scavengers over the search period is expected to be higher for shorter search intervals and lower for longer search intervals. Accordingly, Sc was calculated separately for the two WTG treatments (searched once weekly [7 day search interval] and searched twice weekly [3.5 day search interval]).

Two additional scavenger trials were conducted using five raptor carcasses, placed at five different WTGs between the July, August and January trials. Their presence or absence was recorded during regularly-scheduled carcass searches over the subsequent two weeks, and Sc for raptors and vultures was calculated in the manner as described above.

2.1.2.3 Percent Area Searched

Environment Canada has indicated that 85% to 88% of carcasses fall within 50 m of a WTG base (C. Francis, pers. comm., January 2008, MNR, 2011). Environment Canada (2007b) also specifies that for a WTG of the size as those on Wolfe Island, most bat carcasses fall within 50 m. Accordingly, and to be comparable to the results of post-construction monitoring reported for other Ontario wind power facilities, and in accordance with the Follow-Up Plan, the percent area searched was calculated based on a 50 m radius circle.

In each season (i.e., July 1 to October 15 and October 15 to December 31), searchers filled out a 50 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. Searchers also identified areas that were not clear enough to be searched for small carcasses, but in which large carcasses (such as those of raptors and vultures) would be detectable during regular searches. The area searched was determined for each WTG or MET tower 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 WTG (Ps_x, where x is the WTG number or the MET tower).

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

The overall Ps for the facility during the search period was calculated as the average of Ps_1 through Ps_{86}, with Ps for MET towers calculated separately:

$$Ps = \frac{Ps_1 + Ps_2 + Ps_3 + \ldots + Ps_{86}}{86}$$

Ps was calculated separately for the two WTG treatments (searched once weekly [7 day search interval] and searched twice weekly [3.5 day search interval]) for each season. As discussed further below, Ps for the twice weekly treatment was further divided for each of the operational mitigation trial groups.

2.1.3 Bat Mitigation Research Program

The annual bat mortality rate of 9.71 bats/MW was observed for the period of July 2010 through June 2011. Although below the adaptive management threshold of 12.5 bats per MW as identified in the Follow-Up Plan, TransAlta has proactively developed and implemented a research program to evaluate practical measures to reduce the effects of operating WTGs on bats at Wolfe Island. The research was implemented during the current Reporting Period.

While several of the factors that influence bat mortality at WTG's are poorly understood, the results of post-construction studies across North America generally agree that season and weather conditions (i.e. wind speed) are two factors that do influence bat mortality. Johnson (2004) indicated that over 90% of bat fatalities at wind plants occur between mid-July and the end of September. Arnett et al. (2008) provides a summary of several North American studies that show higher mortality rates in the late summer and early fall. Results of the first two years of post-construction monitoring at the Wolfe Island Wind Plant (May 2009 to December 2010) indicate approximately 86% of bat mortality occur in July through early October. The elevated bat mortality during this late summer and early fall period has been attributed to timing of fall migration of tree bat species (i.e. Hoary Bat, Silver-haired Bat and Eastern Red Bat). These species have comprised the majority of fatalities at Wolfe Island.

Several studies have found that bat mortality appears to be higher on nights with low wind speeds (Baerwald et al. 2009, Kerns et al. 2005). Arnett et al. (2008) reported that at facilities in Meyersdale, Pennsylvania, and Mountaineer, West Virginia, 82% and 85% of the bat fatalities occurred on low wind nights.

The bat mitigation research program undertaken at the Wolfe Island Wind Plant in 2011 used operational controls to prevent the WTG blades from rotating during higher risk conditions (i.e. low wind nights during the fall migration between July 15 and September 30). The research program aimed to compare bat mortality rates at two different cut-in speeds (the wind speed at which the blades begin to rotate) throughout the fall migration period (July 15 to September 30).

The research program was completed in conjunction with the regular mortality monitoring. The program utilized 42 of the 86 WTG's on Wolfe Island, selecting those WTG's that are searched twice weekly during the regular mortality monitoring. Each of the 42 WTG's was randomly placed into three treatment subsets, including;

- Group A – 14 turbines controlled to a cut-in wind speed of 5.5 m/s from sunset to sunrise;
- Group B – 14 turbines controlled to a cut-in wind speed of 4.5 m/s from sunset to sunrise; and
- Group C – 14 turbines remained un-mitigated as a control for comparison.

The corrected number of bat fatalities in each turbine group was calculated using the standard equations described above. As WTG's in each subset were randomly scattered across the wind plant area, scavenging rates were assume to be a constant for each group. As such, the regular monthly Sc values were used in the correction calculations. Searcher efficiency was also assumed to be the same for each treatment group. As percent area searched can vary widely between WTG's, separate Ps values were calculated for each treatment group.

The remainder of the 44 WTG's not used in the research program continued to be surveyed as part of the regular monitoring program. To obtain the total bat mortality rate across the wind plant over the Reporting Period (i.e. July 1 to December 31, 2011), the corrected number of bat fatalities at the 44 WTG's not used in the research program was calculated as usual. The corrected number of bat fatalities at the 42 WTG's used in the research program, outside of the trial period (i.e. July 1 to 14 and October 1 to 15), was also calculated. The total mortality rate over the 6-month Reporting Period was then calculated by combining the corrected number of bat fatalities from the 42 trial WTG's (both within and outside of the trial period) and the 44 WTG's not used in the research program.

2.2 DISTURBANCE EFFECTS

2.2.1 Aerial Waterfowl Surveys

The purpose of the aerial waterfowl surveys was to record the abundance of staging waterfowl in the bays, shorelines and coastal marshes around Wolfe Island. The surveys focused on both the western and eastern portions of the island.

Aerial surveys were conducted using Canadian Wildlife Services ("CWS") methodologies as outlined in Ross (1989). The same methods were used in CWS's 1999 waterfowl surveys, the pre-construction monitoring in 2008 and the post-construction monitoring in 2009, 2010 and 2011.

Pre-construction surveys were undertaken by Stantec and CWS in the fall of 2008. In the fall of 2009, CWS conducted aerial waterfowl surveys of Wolfe Island between late September and early January as part of their eastern Lake Ontario studies and provided the results to Stantec. Surveys in the fall of 2010 were conducted by Stantec. In the current monitoring period, Stantec conducted the aerial waterfowl surveys between September 8, 2011 and January 16, 2012. Survey dates, times and weather conditions are summarized in **Appendix D.** Although outside of the Reporting Period (i.e. July to December, 2011), the January survey from each year has been included for completeness. Due to the seasonally warm winter, the St. Lawrence River and bays surrounding Wolfe Island generally remained open and ice free throughout the survey period.

Surveys were conducted by two qualified surveyors accompanied by one pilot and were conducted from a four-seater fixed-wing aircraft. One surveyor was situated in the front passenger (shore) side of the plane, while the other was situated in the back left, behind the pilot (offshore side). The plane departed from the Kingston airport and completed a standardized route following a line roughly 200 m off the shoreline. Waterfowl numbers were assessed, and individuals were identified to species where possible, and to larger species grouping (guild) when segregation to species was not possible. Observations were recorded on digital audio recorders and later transcribed onto paper data forms.

Data were recorded according to a sector system as established by CWS (see **Figure 2.0, Appendix A** and **Table 2.1, Appendix B**). Data for each of the major staging areas (i.e. Bayfield Bay, Button Bay, Pyke's Bay and Reed's Bay) were collected separately so specific results could be discerned from the sectors. Species were grouped into one of eight guilds (**Table 2.2**, **Appendix B**). Data on waterfowl use of bays are presented in the form of "waterfowl days", as calculated in Dennis and Chandler (1974) and cited by Ross (1989). This analysis involves averaging results for each successive pair of surveys, multiplying the results by the number of days separating each pair, and summing over the migration period.

2.2.2 Winter Raptor Surveys

Wolfe Island has been identified as a significant wintering area for a variety of species of raptors and owls. Results of the pre-construction winter raptor monitoring, which was conducted from November 2006 to March 2007, showed that some species can become abundant during winter months, including one Species at Risk, the Short-eared Owl. In order to provide an assessment of disturbance effects to wintering raptors and owls, a late afternoon survey was conducted for raptors and an early evening survey (from just before sunset to dusk) was conducted for Short-eared Owls.

The post-construction winter raptor surveys were carried out using the same survey protocols as the pre-construction baseline surveys conducted in 2006-2007. Two vehicles were used on each survey, with an experienced surveyor and a driver in each vehicle. The use of two vehicles allowed the study area to be more thoroughly covered during the early evening period.

All north-south roads and most of the east-west roads in the study area were driven at slow speeds (i.e., 30-40 km/h). The fields and woodlots were scanned using binoculars to detect any raptors, and a spotting scope was used for closer inspection of stationary birds. All raptors and owls were recorded and their locations mapped.

On each visit, weather conditions and the route taken were recorded. Survey dates, times and weather conditions are summarized in **Appendix D.** Visibility during each of the surveys was good or excellent.

Winter raptor surveys were completed once every two weeks in November, 2011 through March, 2012. This report provides the results from the November and December surveys only, the two months that fall within the Reporting Period (i.e., July to December, 2011). Results of the full 2011-2012 winter raptor survey will be provided and discussed in the subsequent bi-annual report, Monitoring Report No. 7. Monitoring Report No. 7 will also provide additional detailed analysis and discussion related to raptor abundance and behavior.

3.0 Results

3.1 MORTALITY MONITORING

3.1.1 Correction Factors

3.1.1.1 Searcher Efficiency

Individual searcher efficiency during the Reporting Period ranged from 70.4% to 84.6% (**Table 3.1, Appendix B**). The overall searcher efficiency was subsequently calculated by weighting the individual searcher efficiencies, according to the proportion of WTGs surveyed seasonally by each individual, over the Reporting Period. The weighted searcher efficiency for each month ranged from 0.794 in September to 0.814 in August (**Table 3.2, Appendix B**). These values were applied to assess bat and small bird mortality rates.

Searcher efficiency for raptors and vultures was assumed to be 100% in searchable areas where raptors and vultures were readily visible. In non-searchable areas, searcher efficiency was assumed to be 0%. Unsearched areas within the 50m radius were accounted for in the percent area searched correction factor when calculating the estimate of total mortality.

3.1.1.2 Scavenger Removal

Over the 3.5 day search interval, the proportion of carcasses not removed by scavengers was similar in each of the three trials in July through September (ranging from 0.644 to 0.526, **Table 3.3, Appendix B**). Over the 7 day search interval, the proportion of carcasses not removed by scavengers was similar in July and August (0.538 and 0.556) but significantly lower during the September scavenger trial (0.176, **Table 3.3, Appendix B**). The low scavenger removal value in September appears to be an outlier, as it is well below the otherwise relatively constant scavenger removal rates. Further, the scavenger removal rate over the 3.5 day search interval did not experience the same significant drop in September. Regardless, to be consistent with the methods outlined in the Follow-up Plan, the potentially outlier value of 0.176 was used in the September, October and November correction calculations for turbines in the 7 day interval subset. Analysis of the scavenger trial indicates that in the winter, 73.5% of trial carcasses were not removed by scavengers over the 7 day search interval (**Table 3.3, Appendix B**). This factor was applied to the December correction calculations. These values were applied to assess bat and small bird mortality rates.

The scavenger removal rate of raptor and vulture carcasses is expected to be less than for that of bats and smaller birds. Based on the July, August and January/February scavenger trials using raptor carcasses, approximately 95.7% of raptor and vulture carcasses were not removed by scavengers over the average search interval (n=23) (**Table 3.4, Appendix B**). This scavenging rate was applied to all raptor mortality rates throughout the Reporting Period.

3.1.1.3 Percent Area Searched

The average proportion of the 50 m radius search area that was physically searched in the summer through mid-fall (i.e. July 1 to October 15) was 0.322 and 0.336 for the subsets of WTG's searched once and twice weekly, respectively. In the late fall (i.e. October 15 to November 30), the proportion area searched was 0.278 and 0.281 for once and twice weekly searched WTG's, respectively. In December, when all turbines were searched once weekly, the collective proportion area searched was 0.280.

Specific information was collected related to the visibility to large carcasses (i.e. raptors and vultures). The average proportion of the 50 m radius in which large carcasses were visible in the summer through mid-fall was 0.338 and 0.423 for turbines searched once and twice weekly, respectively. In the late fall, the proportion area searched was 0.438 and 0.549 for turbines searched once and twice weekly, respectively. In December, when all turbines were searched once weekly, the collective proportion area searched was 0.494.

3.1.2 Direct Effects - Birds

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

An 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.

A total of 37 carcasses of 20 bird species were collected during the Reporting Period. A summary is presented in **Table 3.5 (Appendix B)**. All native 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 (i.e., European Starling) is not native to Ontario and has a provincial S-Rank of SNA (i.e., Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities). Six bird carcasses were not identifiable to genus or species, given their advanced state of decomposition.

Four Bobolink fatalities were recorded during the Reporting Period (July 13, 20, 29 and August 22). Three of the Bobolink fatalities were identified as young of the year. The forth Bobolink fatality could not be positively differentiated between a female or young of the year due to the condition of the carcass. This species is listed as Threatened on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007).* Although not listed under the federal *Species at Risk Act* this species was identified as threatened by Committee of the Status of Endangered Wildlife in Canada (COSEWIC) in April of 2010.

Four of the species recorded have been identified as species of conservation priority by Ontario Partners in Flight (2008). Based on the observation dates, all were likely breeding individuals or

young of the year from within the Wind Plant: Bobolink (July 13, 20, 29 and August 22), Eastern Kingbird (July 21), Northern Flicker (August 9) and Savannah Sparrow (August 5).

Two adult Red-tailed Hawk fatalities (July 1 and December 20) and one juvenile Red-tailed Hawk fatality (August 29) were recorded during the course of this Reporting Period. Based on the dates of recovery, the juvenile and one of the adults were likely resident birds with the other adult (December 20th) fatality possibly representing a staging or wintering bird.

Bird fatalities were distributed quite uniformly through the summer and early fall period. Fewer fatalities were recorded after mid-October (**Figure 3.0, Appendix A**). The highest number of bird fatalities over the course of the Reporting Period occurred at T33 (three fatalities each) (**Figure 4.0, Appendix A**). All other WTG's had one, two or no recorded fatalities.

Correcting seasonally for searcher efficiency, scavenger removal rates, and the percent area searched, the 3 raptor and 34 other bird carcasses recovered represent an estimated bird mortality rate for the Reporting Period of 3.71 birds/turbine (1.61 birds/MW) (**Tables 3.6** and **3.7, Appendix B**).

The three raptor carcasses recovered, when corrected for scavenger removal, represent an estimated total raptor mortality rate of 0.09 raptors/turbine (0.04 raptors/MW) for the Reporting Period (**Table 3.6, Appendix B**).

3.1.3 Direct Effects - Bats

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

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.

A total of 52 carcasses of four bat species were collected during the Reporting Period. A summary is provided in **Table 3.8 (Appendix B)**. The Big Brown Bat (8 fatalities), comprising 15.4% of all recorded bat fatalities, has a provincial S-Rank of S5 (i.e., Secure – common, widespread and abundant in Ontario). The Hoary Bat (26 fatalities), Eastern Red Bat (9 fatalities), and Silver-haired Bat (8 fatalities), comprising 82.7% of all bat fatalities, are ranked S4 (i.e., Apparently Secure – uncommon, but not rare) and are classified as long-distance migratory tree bats. One bat carcasses (1.9%) could not be identified to species, given its advanced state of decomposition.

The majority of bat mortality was spread between mid-July and the end of September, with no evident peak in fatalities (**Figure 3.0, Appendix A**). The highest number of bat fatalities over the course of the Reporting Period occurred at T85 (four fatalities), T5 (three fatalities) and T 41 (three fatalities) (**Figure 4.0, Appendix A**).

For the bat mitigation research program, corrected bat mortality rates were calculated separately for each of the treatment groups, the results of which are provided in **Tables 3.9, 3.10** and **3.11** (**Appendix B**). For the research period (July 15 to September 30), the respective estimated bat mortality rates for Group A (5.5 m/s), Group B (4.5 m/s) and Group C (control) were 2.08 bats/turbine (0.91 bats/MW), 2.73 bats/turbine (1.19 bats/MW) and 5.25 bats/turbine (2.28 bats/MW).

Tables 3.12 and **3.13, Appendix B** provides the corrected bat fatalities rates outside of the trial period (i.e. July 1-14 and October 1-15) and for those WTG's not used in the research program. Correction calculation for the latter half of the Reporting Period (i.e. October 16 through December 31) were not provided, as no bat fatalities were recorded during this time. **Table 3.14, Appendix B** summarizes the overall bat mortality rate across the entire wind plant for the Reporting Period, which is estimated at 5.73 bats/turbine (2.49 bats/MW).

3.2 DISTURBANCE EFFECTS MONITORING

3.2.1 Aerial Waterfowl Surveys

Waterfowl data collected during fall 2008, 2009, 2010 and 2011 aerial surveys were grouped into guilds and waterfowl days were calculated for each sector. **Appendix F** presents the waterfowl days by guild for each sector for fall 1999, 2008, 2009, 2010 and 2011. The waterfowl days by guild for each major staging area (i.e., Bayfield Bay, Button Bay, Pyke's Bay and Reed's Bay) for fall 2008 through 2011 are also provided in **Appendix F**; data specific to each major staging area were not collected in 1999.

Table 3.15, Appendix B compares the number of waterfowl days in each sector in 1999, 2008, 2009, 2010 and 2011 inclusive of major staging areas. Overall, there was a high amount of fluctuation in waterfowl days within each sector over the five years of monitoring. A 12% decrease in waterfowl days was observed between 2008 pre-construction (2,234,702) and 2011 post-construction monitoring (1,968,663). When comparing 2009 (2,360,965) and 2010 (1,886,494) post-construction monitoring results to the 2006 pre-construction surveys, the respective changes were 6% and -16%. In 2011, the largest decrease in waterfowl days was observed in Sector 10 with a 41% decrease; sectors 11 and 9 experienced decreases of 23% and 10%, respectively. Decreases in Sector 10 were largely attributed to bay duck and geese observations. Sector 9 experienced decreases in small dabbler observations while Sector 11 showed a decrease in large dabbler and geese observations. Sectors 7 and 8, along the northern portion of the study area, experienced observed increase in waterfowl days of 33% and 27%, respectively, compared to pre-construction surveys. The increase was mostly attributed to an increase in bay ducks, with smaller increases in waterfowl days for mergansers in Sector 7.

Table 3.16, Appendix B compares the waterfowl days in each of the major staging areas in 2008, 2009, 2010 and 2011. As above, there was a high amount of fluctuation within each major staging area among the four years of monitoring. When comparing 2008 pre-construction to 2011

post-construction, waterfowl days in Reed's Bay and Bayfield Bay were relatively similar, with respective changes of -18% and 10%. Decreases of 54 to 64% were observed in Button and Pyke's bays, respectively. The decrease in Reeds Bay is largely due to a decrease in large dabbler observations. Bayfield Bay experienced a decrease in small dabblers waterfowl days, whereas geese and large dabblers observations increased. Button Bay experienced decreases in bay duck observations while Pyke's Bay exhibited a decrease in geese and large dabbler observations and increases in swan, goldeneye and mergansers.

Table 3.17, Appendix B, compares the waterfowl days for each guild in 1999, 2008, 2009, 2010 and 2011. The swan guild generally showed an increasing trend between each year of monitoring. Of the swan observations that were identified to species, 99% were Tundra Swan and only 1% Mute Swan. Waterfowl days for geese show a general decreasing trend between each year of monitoring, while large dabblers experienced an increase in 2011 after a general decreasing trend from 2008 to 2010. The geese guild was comprised almost entirely of Canada Geese, with only four Snow Goose observations. Of those large dabblers identified to species, 66% were Mallards, 32% American Black Duck and less than 1% were Gadwall. The Small dabbler guild, comprised of American Wigeon (82%), Green-winged Teal (17%) and Wood Duck (1%) had particular high waterfowl days in 2008, but similar numbers among the other years of monitoring and was the lowest in 2011. Bay duck observations were similar in 1999 and 2008, with more notable fluctuations between 2009 and 2011. Of the bay duck observations identified to species, the majority were Greater or Lesser Scaup (90%) with some Redhead (10%). The sea duck guild were particularly numerous in 2009 and 2010, but experienced a decrease in 2011. Goldeneye and Merganser waterfowl days were very similar between 2008 pre-construction and 2011 post-construction monitoring. The Goldeneye guild was comprised of 61% Common Goldeneye and 39% Bufflehead. Of the Mergansers identified to species, 81% were Red-breasted Merganser, 11% were Hooded Merganser and the remainders were Common Merganser.

3.2.2 Winter Raptor Surveys

A complete summary of raptors and owls recorded during each survey in November and December 2011 is provided in **Tables 3.18** and **3.19 (Appendix B)**. Rough-legged Hawk (56 observations) was the most abundant raptor observed during the afternoon surveys, followed by Northern Harrier (49 observations) and Red-tailed Hawk (22 observations). Numbers of Short-eared Owl (63 observations) in November and December 2011 were approximately double that of the same period in 2006 (Table 3.17, Appendix B), with a correspondingly increased density (0.3 vs. 0.2 owls per kilometer).

Maximum numbers observed during any one survey in 2011 for each species were 29 Short-eared Owls, 8 Snowy Owls, 22 Rough-legged Hawks, 16 Northern Harriers, 7 Red-tailed Hawks, 6 American Kestrels and 2 Bald Eagles. Only a single observation of a Turkey Vulture was made from November to December 2011.

Average raptor density, calculated as the number of raptors per kilometer of survey across the study area, was relatively similar on each of the four surveys in November and December 2011, ranging from 0.5 to 0.7 raptors per kilometer. During the evening surveys, Short-eared Owls density was more variable, with densities of 0.0, 0.4, 0.7 and 0.2 owls per kilometer for the November 7, 23 and December 5 and 19 surveys, respectively.

As with the results of the 2006-2007 pre-construction raptor surveys, areas of particularly high raptor and Short-eared Owl density (defined as more than five raptors per kilometer or more than three owls per kilometer) were mapped. Areas of high raptor and owl density, as defined above, for the pre-construction and each year of post-construction monitoring are shown in **Figures 5.0** and **6.0, Appendix A**. During the November and December 2011 monitoring, higher concentrations of raptors were generally observed along Conc 4 Rd. and Conc 5 Rd. north of Reed's Bay and centrally in the project area, between Reed's Bay Rd and Bennett Rd. Short-eared Owl concentration areas occurred along Conc 9 Rd. in east end of the project area and in an area bounded by Baseline Rd, Highway 95, Reed's Bay Rd and Conc 4 Rd. in the west end of the project area.

For comparison, results from November and December 2006 pre-construction winter raptor monitoring are also provided in **Tables 3.18** and **3.19**, **Appendix B**. Total raptor numbers were relatively similar between pre-construction and post-construction conditions with only a slight decrease in 2011. Rough-legged Hawk observations were higher in 2011 than during pre-construction surveys. However, Red-tailed Hawk and Northern Harrier numbers were lower than the 2006 pre-construction monitoring, although the numbers were similar to those from 2010. During the evening surveys, Short-eared Owl density was significantly higher in 2011, with an almost 100% increase in the number of observations.

Numbers of wintering raptors and owls are known to vary significantly from year to year, based on prey conditions in their northern breeding and southern wintering areas. **Table 3.20, Appendix B** provides a summary of the results of the Kingston Christmas Bird Count ("CBC") from 2000 to 2011, which demonstrates annual fluctuations in wintering raptor numbers in the Kingston area. The results are presented as number of birds observed per party hour. The CBC data showed similar trends to the Wolfe Island winter raptor monitoring, with peak numbers of Northern Harriers observed in 2006 and similar fluctuations in Red-tailed Hawk and Northern Harrier numbers from 2006 to 2011. It is noted however, that the CBC data did not correlate with the high numbers of Short-eared Owls observed during the 2011 post-construction monitoring.

3.3 NOTIFICATIONS

Section 3.2 of the Follow-up Plan outlines mortality and disturbance thresholds which trigger contact with Environment Canada / Canadian Wildlife Service, the Ontario Ministry of Natural Resources, and Natural Resources Canada. There were four notifications filed during the Reporting Period related to mortality of raptors and vultures or species at risk. (**Table 3.21, Appendix B**)

Notifications and the agency responses are provided in **Appendix X**.

- **High Annual Mortality Rates – Raptors and Vultures**

The notification threshold for high annual mortality rates – raptors as outlined in the Follow-up Plan is two raptor or vulture fatalities over a six-week period. One notification was related to raptor and vulture fatalities, submitted on July 6, 2011 (**Table 3.21, Appendix B**).

3.3.1 Mortality of Species at Risk

The Follow-up Plan requires that any mortality of species at risk must be immediately reported to NRCan, MNR and EC. Three of the four notifications were related to Bobolink fatalities, and were submitted on July 20, August 8 and August 31, 2011 (**Table 3.21, Appendix B**). Bobolink is listed as Threatened on the Species at Risk in Ontario List of the provincial *Endangered Species Act*. Bobolink has also been evaluated as Threatened by COSEWIC but is currently not on a Schedule of the federal *Species at Risk Act*.

4.0 Discussion and Recommendations

4.1 DIRECT EFFECTS – MORTALITY

During the Reporting Period of July 1 and December 30 2011, 37 bird carcasses and 52 bat carcasses were recorded at WTG's. Over the Reporting Period, no fatalities were observed at either of the two MET towers, suggesting mortality rates at the towers were very low to nil. The very low mortality rate can possibly be attributed to the absence of guy wires on the MET towers, which can be associated with bird mortality at other similar structures (e.g. communication towers).

4.1.1 Birds

A review of bird mortality rates from 14 wind power facilities across North America with modern turbines was conducted by Arnett et al. (2007). Results from these facilities were based upon standardized mortality monitoring using a systematic survey process for a minimum of one year and incorporating scavenging and searcher efficiency bias corrections. These studies yielded bird mortality rates ranging from 0.95 to 11.67 birds/MW/year. A recent summary of available mortality rates for birds, raptors and bats has been prepared by the National Wind Coordinating Collaborative ("NWCC") (Strickland et al., 2011), who reports bird mortality rates of up to 14 birds/MW/year.

The estimated mortality rate for the six-month Reporting Period at the Wolfe Island Wind Plant, at 3.71 birds/turbine (1.61 birds/MW), is lower than that observed during the same period in 2010 (8.27 birds/turbine or 3.60 birds/MW). The lower estimated mortality rate can primarily be attributed to a reduction in the actual number of bird fatalities observed (54 fatalities in 2010 compared to 37 in 2011). While there was some variability in the correction factors, they were not considerably different between the two years.

When the results of the Reporting Period (July-December) are combined with the estimated mortality rate for the period January to June 2011 (0.74 birds/MW or 1.72 birds/turbine), the resultant estimated mortality rate is 2.35 birds/MW/year (5.43 birds/turbine/year). This estimated annual mortality rate is below the adaptive management threshold of 11.7 birds/MW identified in the Follow-Up Plan.

The annual bird mortality rate of 2.35 birds/MW is less than half that observed at the Maple Ridge, New York facility (5.81 birds/MW) in 2006 (Jain et al., 2007) and lower than that observed at Maple Ridge in 2007 (3.82 birds/MW; Jain et al., 2009). The Maple Ridge facility is located approximately 75 km south of the Wolfe Island Wind Plant. The Wolfe Island mortality rates are within the mortality range of 0 birds/MW to approximately 14 birds/MW reported by The National Wind Coordinating Collaborative ("NWCC", Strickland et al., 2011) in their review

of fatality rates at 63 North American wind facilities. When comparing numbers, it is important to note that most, if not all of the studies at Maple Ridge and those summarized in the NWCC report did not include winter mortality monitoring, and therefore any fatalities occurring over the winter months were not included in annual mortality rates. The data for the Wolfe Island Wind Plant includes winter fatalities.

The estimated raptor and vulture mortality rate of 0.04 raptors/MW is similar to that observed over the same period in 2009 and 2010. When combined with the estimated mortality rate for the period January to June 2011 (0.08 raptors/MW), the resultant estimated mortality rate is 0.12 raptors/MW/year. This annual raptor and vulture mortality rate is in the middle of the mortality range observed at other facilities in North America outside California (0 – 0.49 raptors/MW; NWCC, Strickland et al., 2011), and would rank 11th out of the 34 wind farms summarized outside of California. It is approximately half of the rate observed at Maple Ridge in 2007 (0.25 raptors/MW as reported by NWCC, Strickland et al., 2011), although higher than the rate observed at Maple Ridge in 2006 (approximately 0.05 raptors/MW, as reported by NWCC, 2010).

The bird mortalities were distributed across many species; generally with one to two fatalities recorded for each species observed. Tree Swallow and Purple Martin fatalities were recorded in slightly higher numbers, with three fatalities each. Collectively, these two swallow species account for 16% of all avian fatalities recorded. Swallows species were identified as having an elevated risk of collision in the ERR based on their observed flight heights. In addition, large numbers of Tree Swallows congregate on Wolfe Island during the summer, prior to fall migration. The combination of large numbers of swallows and their behaviour (aerial foraging within the blade swept zone) was the likely cause of the higher than average fatalities. It is noted the proportion of bird fatalities comprised of swallows (16%) was lower in this Reporting Period, when compared to the same period in 2010 (41%) and 2009 (38%), although antidotal observations suggest swallows remained abundant within the study area in the late summer of 2011.

Bobolinks have been identified as a species of conservation priority by Ontario Partners in Flight (2008). This species was listed as Threatened on the Species at Risk in Ontario list of the provincial *Endangered Species Act (2007),* in September of 2010. Bobolink has also been identified by COSEWIC as Threatened, but has not been added to a schedule of the *Species at Risk Act (200*2). Although not considered at risk at the time of the ERR, it was a species that was identified as having an elevated risk of collision due to their aerial flight displays.

Four Bobolink fatalities were recorded during the Reporting Period, three of which were identified as juveniles. At this time of the year, young Bobolinks have left the nest and have joined mobile flocks of fledglings and adults that move about the breeding habitat (Martin and Gavin, 1995). When combine with the results of the January to June period, a total of 7 Bobolink fatalities have been recorded in 2011. When applying correction factors to the seven Bobolink fatalities, the annual estimated mortality rate is 42.4 Bobolinks (16.4 Bobolinks for

January to June 2011 and 26.0 for July to December 2011). This level of mortality is small relative to the estimated 1,000-1,500 (i.e. approx. 3-4%) that were observed in the study area during pre-construction surveys (approximately 1,050 counted during area searches, plus others observed during point counts; Stantec, 2008) and the estimated Ontario population of 800,000 individuals (i.e. approx. 0.005%) (Cadman et al., 2007). The population estimate for the study area is likely a conservative one, because it was based on surveys of territorial birds in spring, and would not account for young birds fledged later in summer. It is therefore likely that the percentage of the local population affected (i.e., 3-4%) would be lower if these additions of young were accounted for.

Three other species of conservation priority (Northern Flicker, Eastern Kingbird and Savannah Sparrow) were on the list of fatalities, with one individual recorded each. This level of mortality is not considered to result in a measureable impact to the local, regional or provincial populations of these species.

4.1.2 Bats

Arnett et al. (2007) summarized the bat mortality rates from 22 wind facilities in North America where recent standardized mortality monitoring was conducted using a systematic survey process for a minimum of one year and incorporating scavenging and searcher efficiency corrections. The bat mortality rates ranged from 0.3 to 53.3 bats per MW per year. Of the seven sites located in the eastern U.S., the bat mortality rates ranged from 14.9 to 53.3 bats per MW. A recent summary of available mortality rates for bats has been prepared by the National Wind Coordinating Collaborative (“NWCC”) (Strickland et al., 2011), who reports bat mortality rates of between less than one and approximately 40 bats/MW/year.

The overall estimated mortality rate for the Reporting Period at the Wolfe Island Wind Plant at 2.49 bats/MW (5.73 bats/turbine) is lower than the rate observed over the same period in 2010 (9.50 bats/MW) or 2009 (6.42 bats/MW). This reduction in bat mortality in the fall of 2011 can be attributed, in part, to the implementation of operational mitigation at subsets of turbines. However, it is noted that the unmitigated Group C and the WTG’s not included in the research program also had lower mortality rates in July through December 2011when compared to 2009 or 2010.

When the results of the Reporting Period (July-December) are combined with the estimated mortality rate for the period January to June 2011 (0.21 bats/MW or 0.48 bats/turbine), the resultant estimated mortality rate of 2.70 bats/MW/year (6.21 bats/turbine/year) is well within the range of rates reported by NWCC (Strickland et al., 2011) and Arnett et al., (2007).

A bat mitigation research program was implemented during the Reporting Period to evaluate practical measures to reduce the effects of operating WTGs on bats at Wolfe Island. The research program used operational controls on selected WTGs to prevent the blades from spinning during higher risk periods (i.e. night time hours under low wind conditions during the

fall migration between July 15 and September 30). The research program aimed to compare bat mortality rates at two different wind cut-in speeds.

The research program involved two treatment subsets of 14 WTGs each, set at cut-in wind speeds of 5.5 m/s (Group A) and 4.5 m/s (Group B), to compare the effectiveness of the mitigation at two different cut-in speeds. A subset of un-mitigated turbines (14 WTGs) was used as a control (Group C). A summary of the estimated bat mortality rates in the three different treatment groups is provided in **Table 3.14, Appendix B**.

The number of actual bat fatalities observed during the research program was relatively low, ranging from five fatalities found at Group A turbines (5.5 m/s) to eight at Group B turbines (4.5 m/s). Seven bat carcasses were discovered at the Group C turbines (un-mitigated). Once corrections factors were applied, some differences in the estimated bat mortality rates were observed. The corrected mortality rate at Group C (un-mitigated) of 5.25 bats/turbine was approximately twice that observed at the mitigated Group A (5.5 m/s) and Group B (4.5 m/s) subsets, with respective mortality rates of 2.08 and 2.73 bats/turbine. While the estimated mortality rates between the two mitigated groups was relatively low, WTG's in Group B, with rotors that began to turn at slightly lower wind speeds, had a slightly higher mortality rate than Group A WTG's. However, given the overall low number of fatalities observed during the research program, a thorough statistical analysis of the results is not feasible at this time.

4.2 INDIRECT EFFECTS – DISTURBANCE

4.2.1 Migratory Waterfowl

Total waterfowl days recorded by the aerial waterfowl surveys were similar in 1999, 2008 and 2009, with a decrease observed in 2010. The total waterfowl days in 2011 were similar to that of 2010. The largest decrease in waterfowl days in 2011 was observed in Sector 10, which includes Button and Pyke's Bay. Conversely, Sectors 7 and 8, along the north side of the study area, experienced an increase in waterfowl days in 2011.

The decrease in waterfowl days between 2008 and 2011 could be due in part to natural variability and the uncertainty related to sampling on this scale. In addition, waterfowl day calculations can be influenced by survey interval which can be affected by weather and survey scheduling. As such, the 12% decrease in waterfowl days observed between 2008 and 2011 is not considered significant and is well below the threshold of potentially significant decline as defined in the Follow-Up Plan (i.e. 30%).

Within individual sectors, the aerial waterfowl surveys found notable fluctuations in the number of waterfowl days between years. Such fluctuations are not necessarily an indication that importance of sectors to staging waterfowl varied from year to year. Fluctuations between sectors were most likely a result of flock movement and the location where large flocks were recorded at the time of surveys.

Waterfowl days of the swan guild were variable between the 2008, 2009, 2010 and 2011 surveys, but generally appeared to be more abundant than in 1999. From the monitoring surveys from 2008 to 2010, Sectors 9 and 10, along the south shore of the island, appear to be the most important staging area for swans. However, in 2011 Sector 8, along the north shore, experienced its highest number of observations as measured through waterfowl days. The Ontario Breeding Bird Atlas (Cadman et al., 2007) suggests Tundra Swan has experienced a significant increase in Hudson Bay Lowlands breeding population (67% increase in probability of observation) since the first atlas period (1981-1985). An increased breeding population likely explains the increase in staging migrants observed.

Waterfowl days recorded by aerial surveys for geese were relatively similar in 2008 and 2009, with a decreasing trend in 2010 and 2011. Large dabblers has seen a fluctuating trend over the four years of monitoring between 2008 and 2011, with lowest numbers recorded in 2009. Aerial observations within the bays and along the shoreline may have been dependent on the numbers of geese and large dabblers foraging inland during the survey. It is noted that although ground-based surveys were not conducted in 2011, these surveys recorded an increase in geese and large dabblers waterfowl days between 2008 pre-construction and 2010 post-construction surveys, suggesting no decline in abundance of species in these guilds.

Overall, small dabblers appeared to be less abundant in 2011, with a notable decrease from 2008. However, when compared to 2009 and 2010, the large number of small dabbler observations in 2008 appears to be an outlier, representing much higher than average abundance.

Waterfowl days for bay ducks were variable throughout the five years of monitoring, with 2011 appearing to be a relatively average year. Waterfowl days for sea ducks had similar abundances in all years of post-construction monitoring compared to the 2008 pre-construction surveys. It is noted however, that the percent change calculation (4581%) is exaggerated due to the relatively small number of observations in this guild.

Waterfowl days for goldeneye and merganser guilds were highly variable between the years. The fluctuations in goldeneye, mergansers and bay ducks can likely be attributed to natural variability in staging abundance; staging numbers of the goldeneye guild in particular are known to fluctuate widely among years (K. Ross, pers. comm., 2010).

4.2.2 Wintering Raptors

Annual numbers of most overwintering raptors are dependent upon the number of meadow voles, the populations of which vary in a cyclical fashion. The density of raptors overwintering on Wolfe Island may be dependent upon the meadow vole population on the island itself and/or vole populations further north that will influence the extent of raptor migration.

Raptor numbers recorded in November and December 2011 were generally similar to those during the same period of the pre-construction surveys in 2006. Compared to the 2006 surveys, Northern Harriers and Red-tailed Hawks were less abundant in 2011, but Rough-legged Hawks and Snowy Owls were more abundant. Short-eared Owls were found to be particularly more common in November and December 2011, when compared to 2006.

Christmas Bird Count ("CBC") results (**Table 3.20, Appendix B**), which include observations throughout the Kingston count circle, generally correlate to the observations in the 2006 pre-construction and 2011 post-construction monitoring on Wolfe Island. Both surveys recorded peaks of Northern Harriers and Red-tailed Hawks in 2006, Rough-legged Hawks in 2010 and Snowy Owls in 2011. It was noted that, while both surveys recorded peaks in Short-eared Owls in 2010, the CBC did not recorded similarly high numbers in 2011, as was observed by the November and December post-construction monitoring on Wolfe Island. This difference could potentially be explained by weather conditions during the CBC surveys. Overall, the results of the November/December 2011 Wolfe Island winter raptor monitoring and CBC suggest the winter of 2011/2012 represents a relatively average year for winter raptor abundance.

Due to the overall low raptor density in 2009, areas of particularly high raptor density (more than five raptors per kilometer) were not observed. However, during the other three years of monitoring several concentration areas were observed, with some variability in distribution (**Figure 5.0, Appendix A**). Areas of Short-eared Owl concentration were observed in all four years of monitoring, generally occurring in the southern and western portion of the project area (**Figure 6.0, Appendix A**). A more thorough discussion of winter raptor surveys, including an analysis of the complete season (November 2011 through March 2012), will be provided in the subsequent Monitoring Report No. 7.

4.3 RECOMMENDATIONS

Mortality and disturbance effects monitoring should proceed in the January to June 2012 Reporting Period, in accordance with the February 2010 Follow-up Plan.

During the 2011 bat mitigation research program relatively low numbers of bat fatalities were recorded. As a result of the small dataset, a thorough statistical analysis is not feasible at this time. An additional year of research (i.e. July 15 to September 30, 2012) is recommended to collect a larger dataset which may allow for a statistical comparison between the treatment groups.

Three years of fall monitoring have shown relatively consistent numbers of offshore staging waterfowl. As such, it is recommended that aerial survey of offshore staging areas be discontinued in 2012.

STANTEC CONSULTING LTD.

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Nicole Kopysh
Ecologist

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5.0 References

Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, J. R. Mason, M. L. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, Maryland, USA.

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, T. H. Henry, G. D. Johnson, J. Kerns, R. R. Kolford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of fatality of bats at wind energy facilities in North America. Journal of Wildlife Management 72: 61–78.

Baerwald, E. F., J. Edworthy, M. Holder, and R. M. R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management 73: in press.

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage and A. R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto. Xxii + 706 pp.

C. Francis, pers. comm. Environment Canada, January 29, 2008.

Committee on the Status of Species at Risk in Ontario (COSSARO). 2010. Classification and Rationales from June 2010 COSSARO meeting. June 2010.

Dennis, D. G. and R. E. Chandler. 1974. Waterfowl use of the Ontario shoreline of the southern Great Lakes during migration. Pp. 58-65 in H. Boyd (ed.), Canadian Wildlife Service Waterfowl Studies in eastern Canada. Canadian Wildlife Service Report Series No. 29, Ottawa, Canada.

Environment Canada. 2007a. Wind Turbines and Birds - A Guidance Document for Environmental Assessment. Final: February 2007.

Environment Canada. 2007b. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Final: February 2007.

Jain, A., P. Kerlinger, R. Curry and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project: Postconstruction Bird and Bat Fatality Study – 2006. Final Report, June 25, 2007. Prepared for PPM Energy and Horizon Energy and Technical Advisory Committee for the Maple Ridge Project Study.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed and J. Meacham. 2009. Annual Report for the Noble Clinton Windpark, LLC: Postconstruction Bird and Bat Fatality Study –

2008. April 13, 2009. Prepared for Noble Environmental Power, LLC.Kerns, J., W. P. Erickson and E. B. Arnett. 2005. Bat and bird fatality at wind energy facilities in Pennsylvania and West Virginia. Page 24-95 in E. B. Arnett, ed., Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of bat fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International, Austin, TX.

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat activity, composition and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32:1278–1288.

Kerns, J, W. P. Erickson, and E. B. Arnett. 2005. Bat and bird fatality at wind energy facilities in Pennsylvania and West Virginia. Pages 24–95 in E. B. Arnett, editor. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of bat fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International, Austin, Texas, USA.

Martin, Stephen G. and Thomas A. Gavin. 1995. Bobolink (Dolichonyx oryzivorus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/176

Ontario Ministry of Natural Resources. 2007. Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats. Developmental Working Draft – August 2007.

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

Ontario Partners in Flight. 2008. Ontario Landbird Conservation Plan: Lower Great Lakes/St. Lawrence Plain (North American Bird Conservation Region 13), Priorities, Objectives and Recommended Actions. Environment Canada (Ontario Region) and Ontario Ministry of Natural Resources.

Ross, R. K. 1989. A re-survey of migrant waterfowl use of the Ontario St. Lawrence River and northeastern Lake Ontario. Technical Report Series No. 52. Canadian Wildlife Service, Ontario Region.

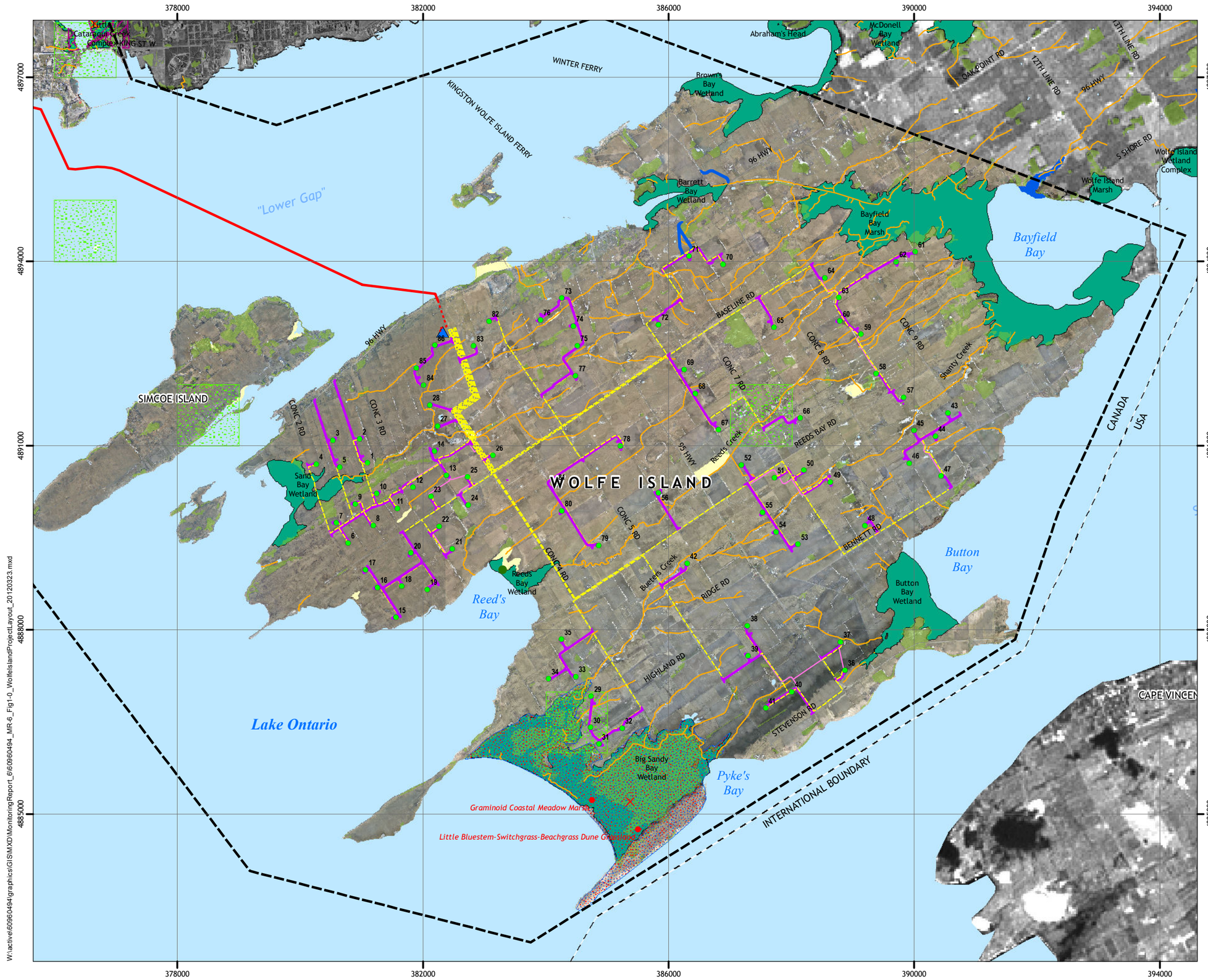
Stantec Consulting Ltd. 2008. Environmental Review Report: Wolfe Island Wind Project. November 2008.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L. Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind

Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative, Washington, D.C., USA

Appendix A

Figures



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N W E S

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 Occurence
- Woodlot

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009.
3. Image Sources: © 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.

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Client/Project

WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 6

Figure No.

1.0

Title

Wolfe Island Project Layout

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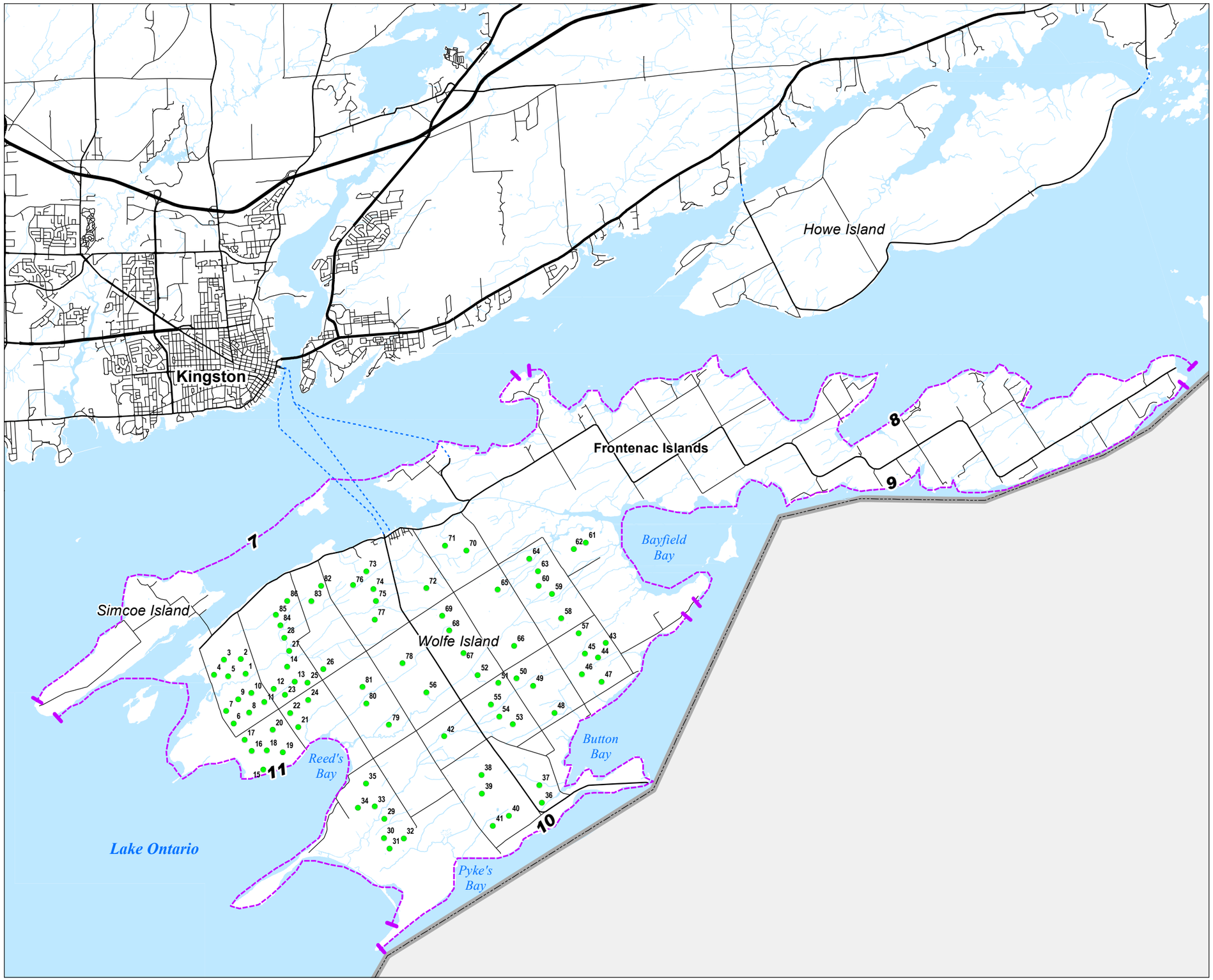

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Legend

- Turbine Layout
- Expressway / Highway
- Primary Road
- Secondary Road
- Ferry
- International Boundary
- Watercourse
- Waterbody

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources
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WOLFE ISLAND ECOPOWER CENTRE
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Figure No.

2.0

Title

Wolfe Island Waterfowl Survey Sectors

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Figure 3.0. Wolfe Island Wind Farm: Numbers of Bird and Bat Fatalities by Survey Date

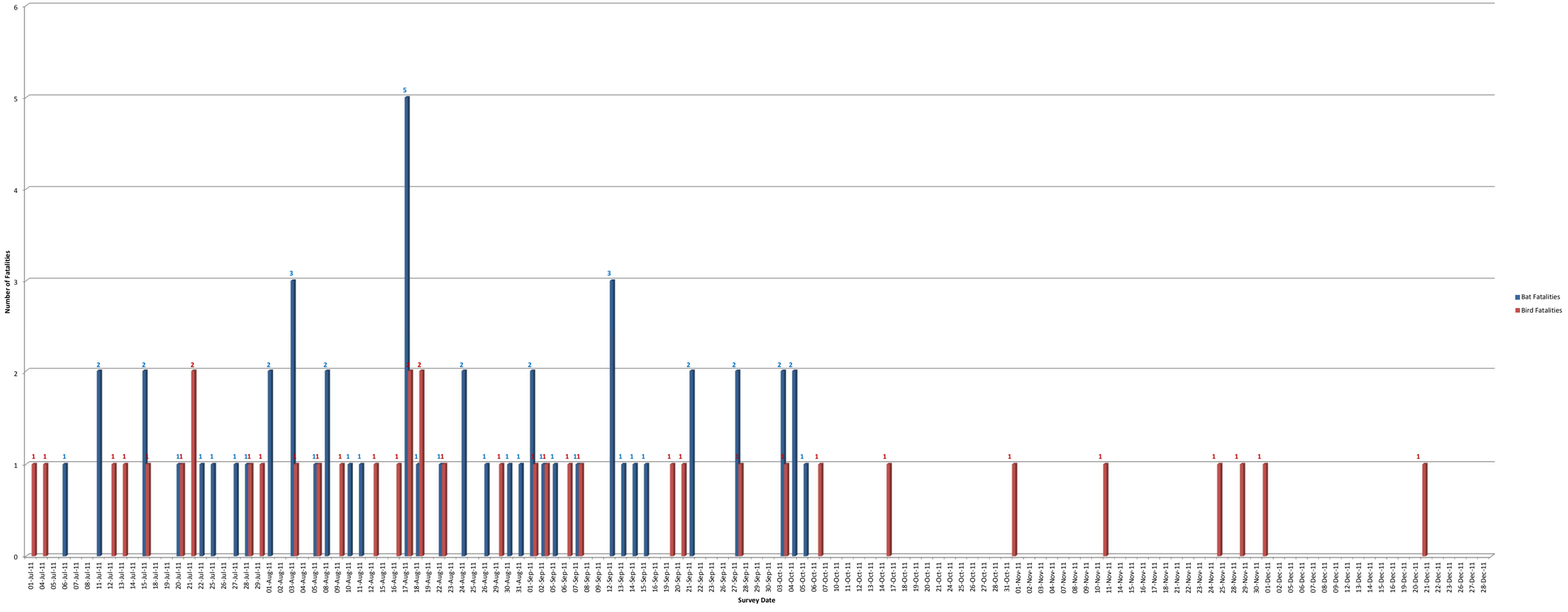
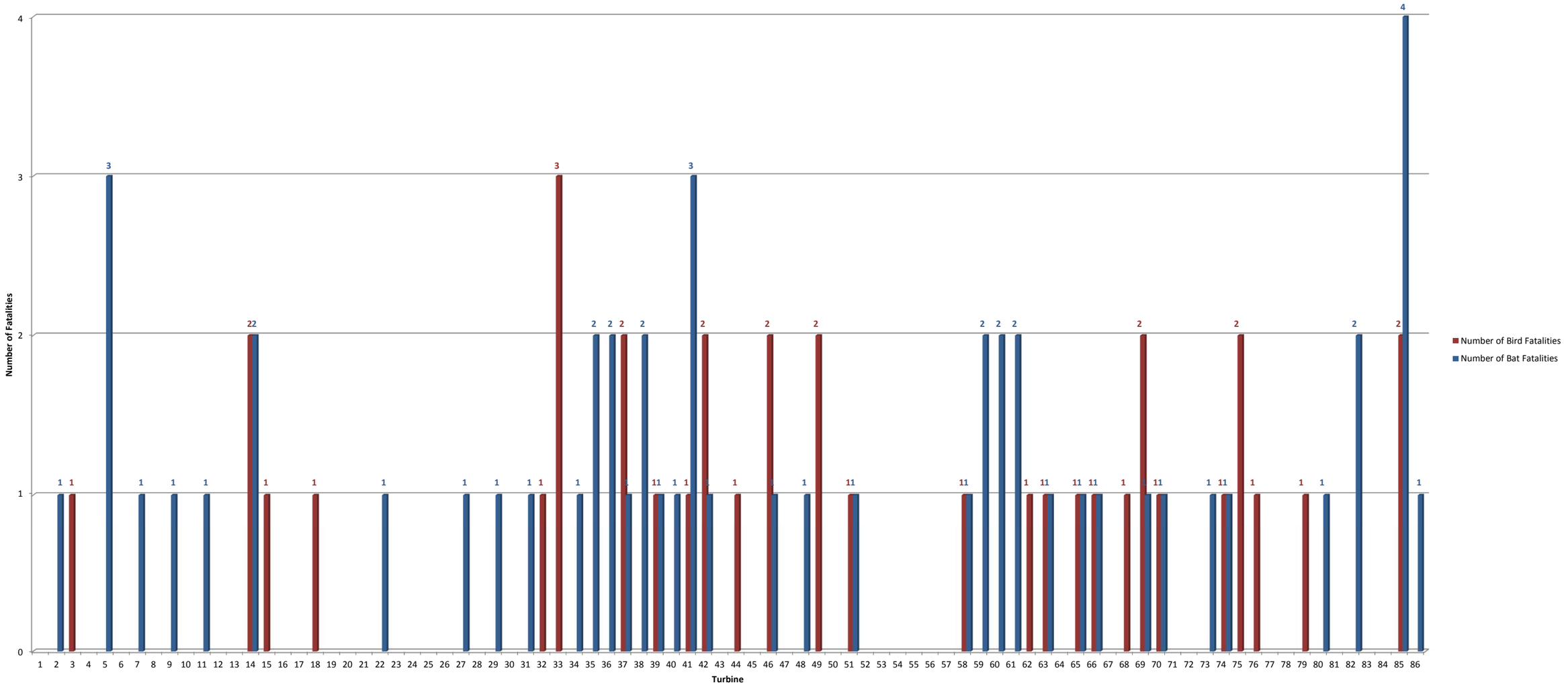


Figure 4.0. Wolfe Island Wind Farm: Bird and Bat Fatalities by Turbine
July 1 Through December 30, 2011



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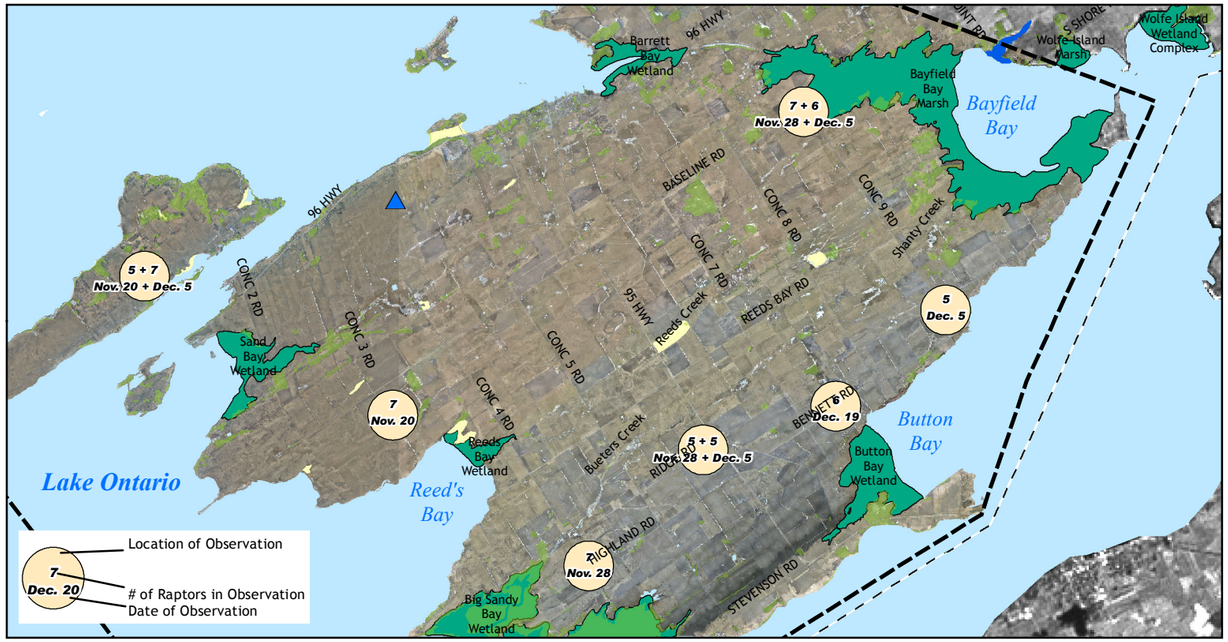
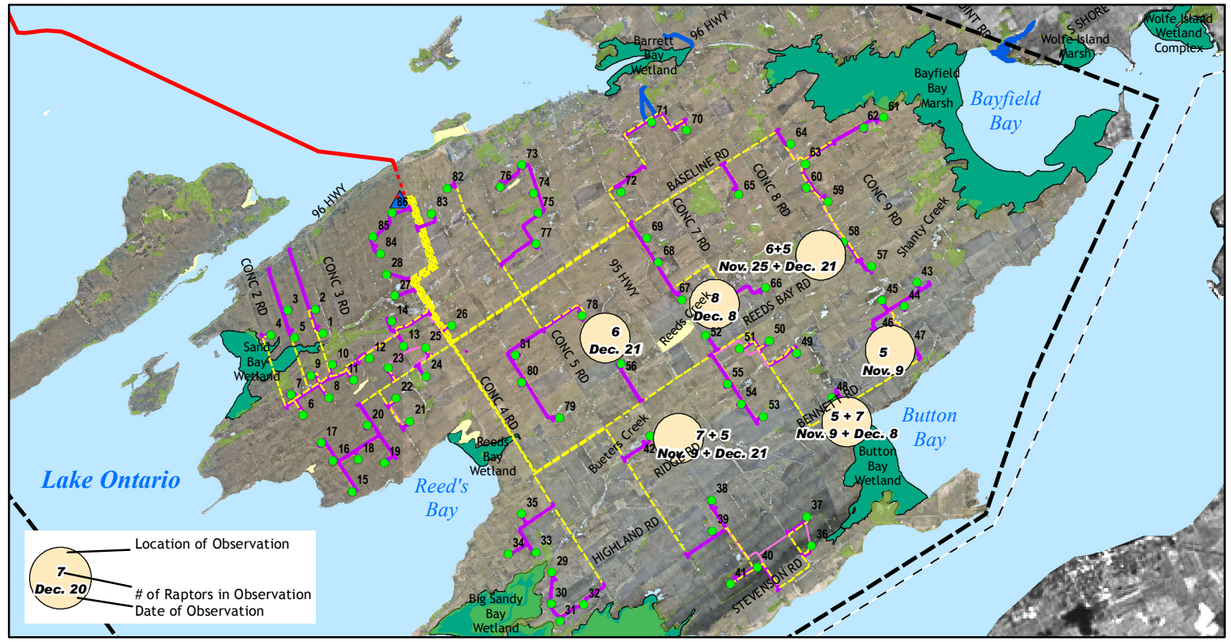


2010 Post-Construction Results



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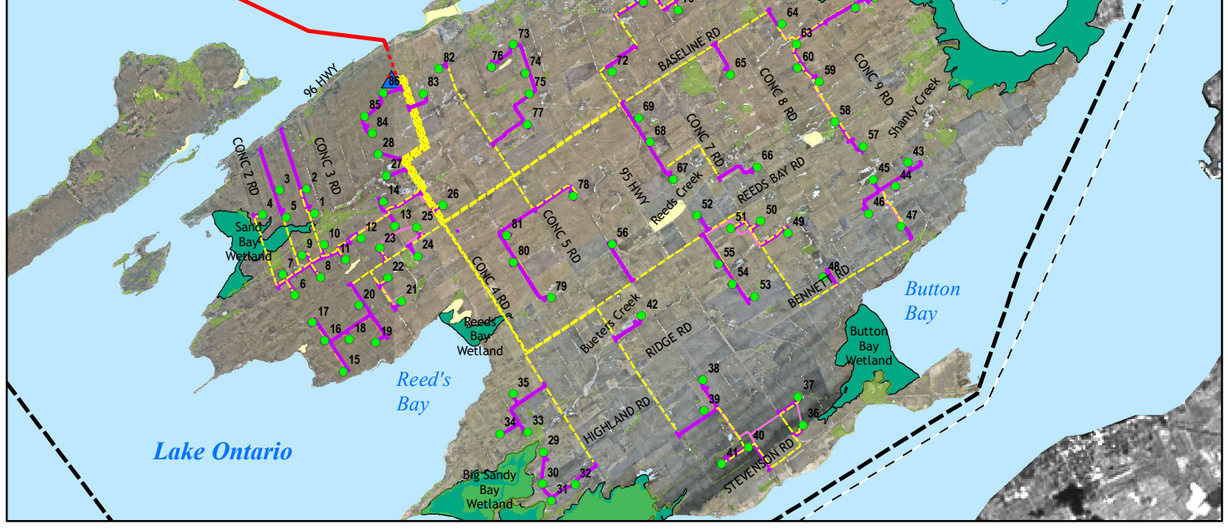

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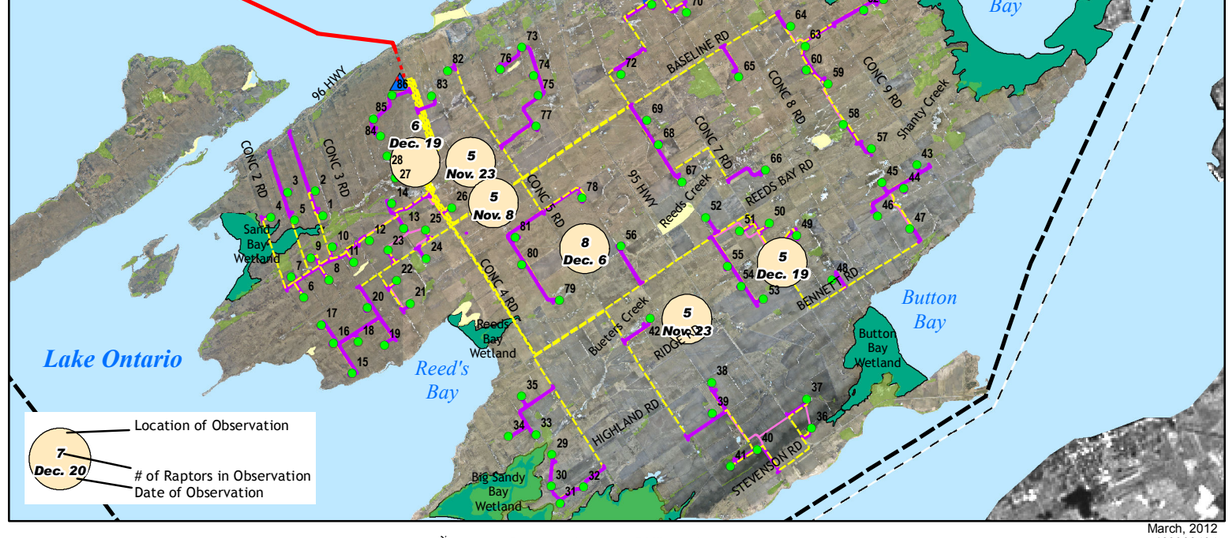

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Legend

- 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
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 6

Figure No.

5.0

Title

Comparison of Wintering Raptor Concentrations Nov-Dec 2006, 2009, 2010 and 2011

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
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3. Image Sources: © 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.

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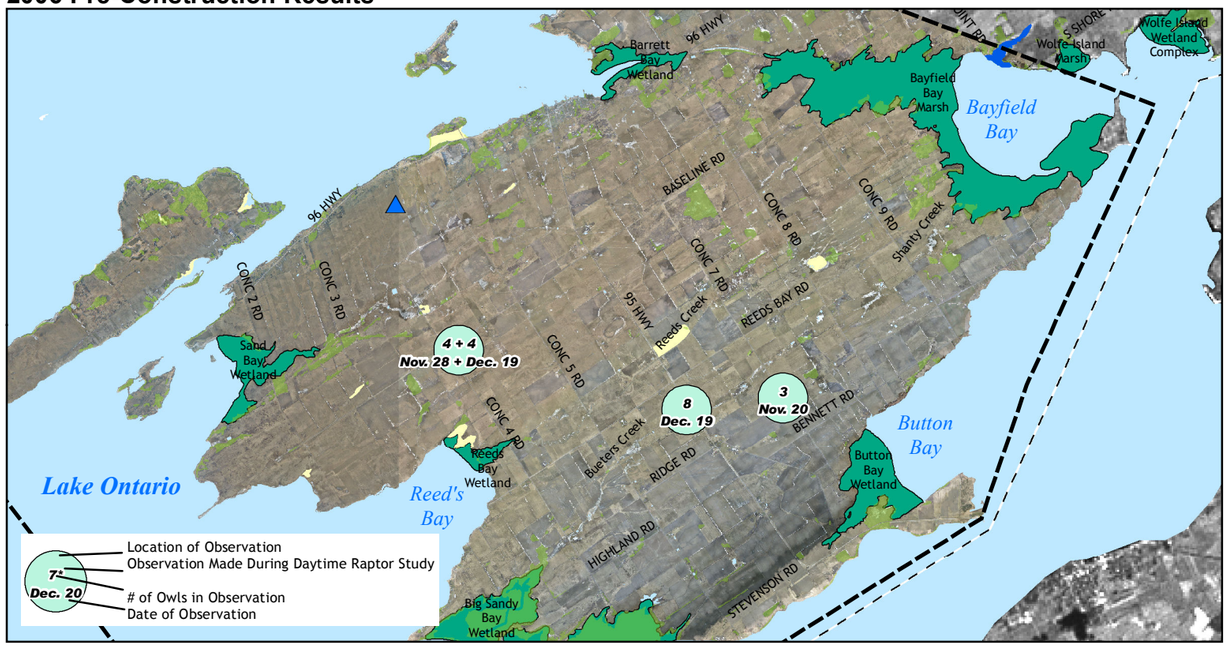
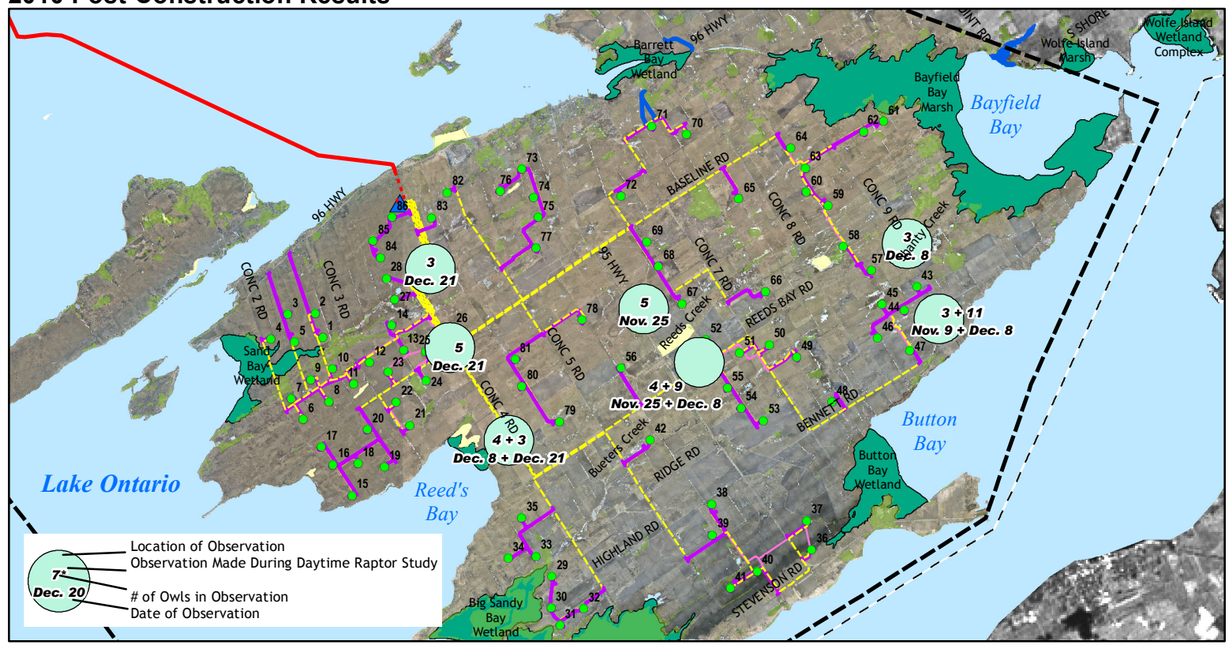
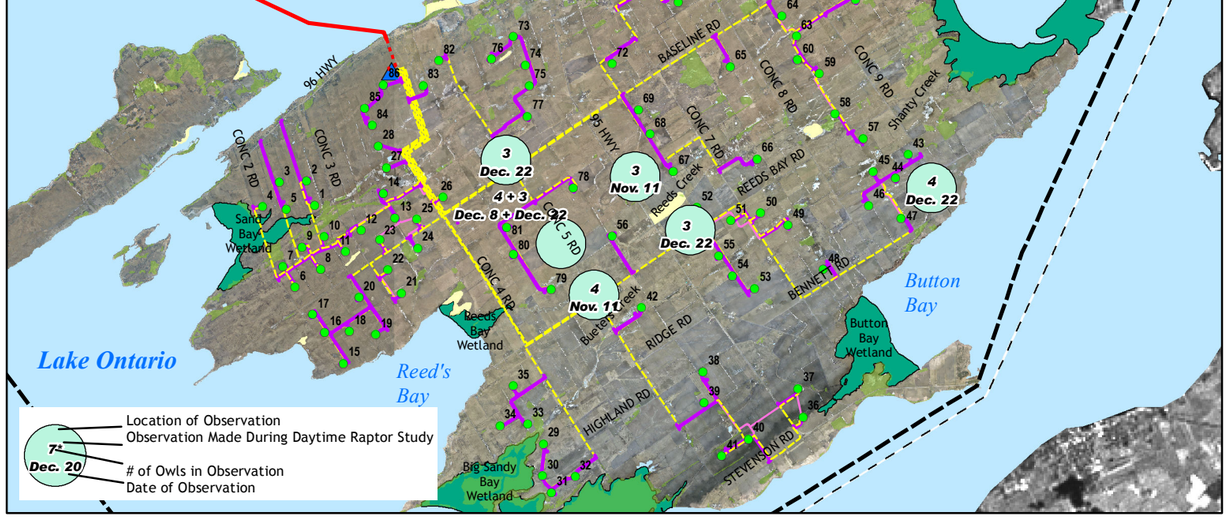
2006 Pre-Construction Results



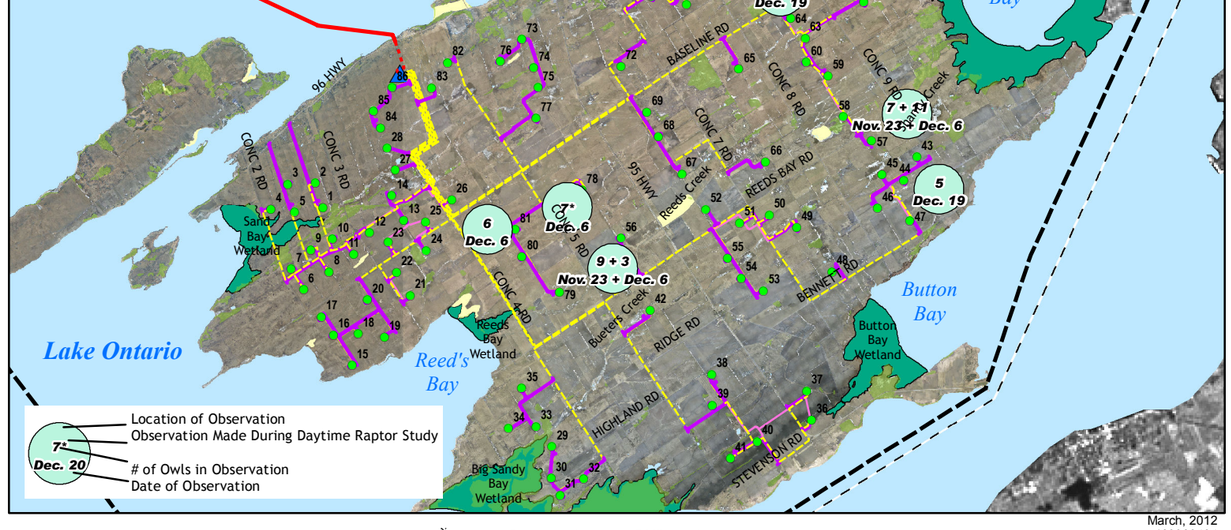
2010 Post-Construction Results



2009 Post-Construction Results



2011 Post-Construction Results



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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
- Woodlot

Wetlands

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland

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WOLFE ISLAND ECOPOWER CENTRE
MONITORING REPORT NO. 6

Figure No.

6.0

Title

Comparison of Wintering Short-eared Owl Concentrations Nov-Dec 2006, 2009, 2010 and 2011

Notes

1. Coordinate System: UTM NAD 83 - Zone 18 (N).
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009.
3. Image Sources: © LIDAR (study area coverage), January 2006; © LANDSAT7 (U.S. coverage), 1999; © City of Kingston (city coverage), 2005.

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Appendix B

Tables

Table 2.1: Aerial Waterfowl Survey Sectors

Sector	Description
C7	Nine Mile Point to 10th Line near Brophy Point
C8	10th Line near Brophy Point to the tip of the island north of Port Metcalf
C9	Tip of the island north of Port Metcalf to Carpenter Point including Bayfield Bay
C10	Carpenter Point to Bear Point
C11	Bear Point to Nine Mile Point

Table 2.2: Species Composition of Waterfowl Guilds

Guild	Species
Swans	Tundra Swan (*Cygnus columbianus*), Trumpeter Swan (*Cygnus buccinator*), Mute Swan (*Cygnus olor*).
Geese	Snow Goose (*Anser caerulescens*), Brant (*Branta bernicula*), Canada Goose (*Branta Canadensis*)
Large Dabblers	American Black Duck (*Anas rubripes*), Mallard *(Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Gadwall (*Anas strepera*)
Small Dabblers	Wood Duck (*Aix sponsa*), Green-winged Teal (*Anas crecca*), Blue-winged Teal (*Anas discors*), American Wigeon (*Anas Americana*), Northern Shoveler (*Anas clypeata*)
Bay Ducks	Canvasback (*Aythya valisineria*), Redhead (*Aythya americana*), Ring-necked Duck (*Aythya collaris*), Greater Scaup (*Aythya marila*), Lesser Scaup (*Aythya affinis*), Ruddy Duck (*Oxyura jamaicensis*)
Sea Ducks	Long-tailed Duck (*Clangula hyemalis*), Black Scoter (*Melanitta nigra*), Surf Scoter (*Melanitta perspicillata*), White-winged Scoter (*Melanitta fusca*), Common Eider (*Somateria mollissi*), King Eider (*Somateria spectabilis*)
Goldeneye	Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*)
Merganser	Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*)

Table 3.1 Results of Searcher Efficiency Trials July - December 2011

Surveyor	number of carcasses placed	number of carcasses scavenged	number of carcasses found	Individual Se
1	32	9	19	0.826
2	20	0	16	0.800
3	31	4	19	0.704
4	15	2	11	0.846

Table 3.2: Weighted Searcher Efficiency by Month

Surveyor	Individual Se	July: Proportion of Searching (Weighted Se)	August: Proportion of Searching (Weighted Se)	September: Proportion of Searching (Weighted Se)	October: Proportion of Searching (Weighted Se)	November: Proportion of Searching (Weighted Se)	December: Proportion of Searching (Weighted Se)
1	0.826	36.1% (0.298)	23.6% (0.195)	29.0% (0.239)	28.6% (0.236)	31.5% (0.261)	33.2% (0.274)
2	0.800	54.8% (0.439)	40.3% (0.322)	50.1% (0.401)	47.6% (0.381)	46.0% (0.368)	39.1% (0.312)
3	0.704	6.1% (0.043)	6.5% (0.046)	16.2% (0.114)	9.6% (0.068)	13.0% (0.091)	16.0% (0.113)
4	0.846	3.0% (0.026)	29.7% (0.251)	4.7% (0.040)	14.2% (0.120)	9.5% (0.080)	11.7% (0.099)
		100% (0.805)	**100% (0.814)**	**100% (0.794)**	**100% (0.805)**	**100% (0.800)**	**100% (0.799)**

Table 3.3: Results of Scavenger Trials by Month

	Number of Test Carcasses Placed	Number Remaining - Visit 1	Number Remaining - Visit 2	Number Remaining - Visit 3	Number Remaining - Visit 4	Sc
July - 3.5d interval	38	27	18	8	3	0.644
July - 7d interval	38	27	8	-	-	0.538
August - 3.5d interval	38	25	16	10	4	0.618
August - 7d interval	38	25	10	-	-	0.556
September - 3.5d interval	20	13	3	2	2	0.526
September - 7d interval	20	3 (interference with 6)	0	-	-	0.176
January - 7d interval	19	15	10	-	-	0.735

Table 3.4: Results of Raptor Scavenger Trials

	Number of Test Carcasses Placed	Number Remaining - Visit 1	Number Remaining - Visit 2	Number Remaining - Visit 3	Number Remaining - Visit 4	Sc
July – 3.5d interval	2	2	2	2	2	1.000
August - 3.5d interval	2	2	2	2	1	0.875
January - 7d interval	1	1	1	-	-	1.000
Overall	5	5	5	4	3	0.957

Table 3.5: Summary of Bird Fatalities, Reporting Period

Species	Dates Observed	Turbines
American Crow	12-Aug-11	42
American Goldfinch	31-Oct-11	85
Bay-breasted Warbler	02-Sep-11	69
Bird sp.	12-Jul-11	33, 58, 65, 66, 68, 76
	16-Aug-11	
	17-Aug-11	
	18-Aug-11	
	19-Sep-11	
	06-Oct-11	
Black-throated Blue Warbler	03-Oct-11	37
Bobolink (juv)	13-Jul-11	14, 15, 79
	20-Jul-11	
	29-Jul-11	
Bobolink	22-Aug-11	33
Brown-headed Cowbird	18-Aug-11	46, 63
	30-Nov-11	
Cedar Waxwing	17-Aug-11	14, 41
	07-Sep-11	
Downy Woodpecker	24-Nov-11	46
Eastern Kingbird	21-Jul-11	37
European Starling	10-Nov-11	75
Golden-crowned Kinglet	28-Nov-11	85
Lesser Yellowlegs	20-Sep-11	49
Northern Flicker	09-Aug-11	51
Northern Parula	14-Oct-11	69
Purple Martin (juv)	28-Jul-11	33, 70
	06-Sep-11	
Purple Martin	06-Sep-11	74
Red-tailed Hawk (juv)	29-Aug-11	44
Red-tailed Hawk	01-Jul-11	32, 42
	20-Dec-11	
Ring-billed Gull	04-Jul-11	62
Savannah Sparrow	05-Aug-11	18
Tree Swallow	15-Jul-11	39, 49. 75
	21-Jul-11	
	27-Sep-11	
Yellow Warbler	03-Aug-11	3

Table 3.6: Calculation of Raptor and Vulture Mortality Rates

Month (Search Interval)	c -raptors and vultures	Ps	Sc	Se	C -raptors and vultures
July (2x weekly)	0	0.423	0.957	1.000	0.00
July (1x weekly)	1	0.338	0.957	1.000	3.09
August (2x weekly)	1	0.423	0.957	1.000	2.47
August (1x weekly)	0	0.338	0.957	1.000	0.00
September (2x weekly)	0	0.423	0.957	1.000	0.00
September (1x weekly)	0	0.338	0.957	1.000	0.00
October[1] (2x weekly)	0	0.423	0.957	1.000	0.00
October[1] (1x weekly)	0	0.338	0.957	1.000	0.00
October[2] (2x weekly)	0	0.549	0.957	1.000	0.00
October[2] (1x weekly)	0	0.438	0.957	1.000	0.00
November (2x weekly)	0	0.549	0.957	1.000	0.00
November (1x weekly)	0	0.438	0.957	1.000	0.00
December (1x weekly)	1	0.494	0.957	1.000	2.12
Total	**3**				**7.68**
Per Turbine					**0.089**
Per MW					**0.039**

October[1] covers the period October 1 to 15
October[2] the period October 16 to 31

Table 3.7: Calculation of Bird Mortality Rates (Other Than Raptors and Vultures)

Month (Search Interval)	c -birds	Ps	Sc	Se	C -birds
July (2x weekly)	6	0.336	0.644	0.805	34.45
July (1x weekly)	3	0.322	0.538	0.805	21.51
August (2x weekly)	6	0.336	0.618	0.814	35.50
August (1x weekly)	4	0.322	0.556	0.814	27.45
September (2x weekly)	5	0.336	0.526	0.794	35.63
September (1x weekly)	2	0.322	0.176	0.794	44.45
October[1] (2x weekly)	2	0.336	0.526	0.805	14.06
October[1] (1x weekly)	1	0.322	0.176	0.805	21.92
October[2] (2x weekly)	1	0.281	0.526	0.805	8.40
October[2] (1x weekly)	0	0.278	0.176	0.805	0.00
November (2x weekly)	2	0.281	0.526	0.800	16.91
November (1x weekly)	2	0.278	0.176	0.800	51.10
December (1x weekly)	0	0.280	0.735	0.799	0.00
Total	**34**				**311.37**
Per Turbine					**3.621**
Per MW					**1.574**

October[1] covers the period October 1 to 15
October[2] the period October 16 to 31

Table 3.8: Summary of Bat Fatalities, Reporting Period

Species		Turbines
Bat Sp.	17-Aug-11	41
Big Brown Bat	11-Jul-11	14, 29, 35, 38, 61, 69, 82, 85
	15-Jul-11	
	20-Jul-11	
	05-Aug-11	
	08-Aug-11	
	17-Aug-11	
	03-Oct-11	
	04-Oct-11	
Hoary Bat	06-Jul-11	5, 22, 31, 34, 36, 36, 37, 39, 40, 41, 46, 59, 59, 60, 60, 61, 63, 65, 66, 70 74, 80, 82, 85, 85, 86
	11-Jul-11	
	15-Jul-11	
	25-Jul-11	
	28-Jul-11	
	01-Aug-11	
	01-Aug-11	
	03-Aug-11	
	03-Aug-11	
	08-Aug-11	
	10-Aug-11	
	11-Aug-11	
	17-Aug-11	
	18-Aug-11	
	22-Aug-11	
	24-Aug-11	
	24-Aug-11	
	31-Aug-11	
	02-Sep-11	
	05-Sep-11	
	07-Sep-11	
	14-Sep-11	
	27-Sep-11	
	03-Oct-11	
	04-Oct-11	
Red Bat	22-Jul-11	2, 5, 7, 11, 14, 38, 41, 51, 58
	27-Jul-11	

Table 3.8: Summary of Bat Fatalities, Reporting Period

Species		Turbines
	17-Aug-11	
	17-Aug-11	
	26-Aug-11	
	30-Aug-11	
	12-Sep-11	
	27-Sep-11	
	05-Oct-11	
Silver-haired Bat	01-Sep-11	5, 9, 27, 35, 42, 48, 73, 85
	01-Sep-11	
	12-Sep-11	
	12-Sep-11	
	13-Sep-11	
	15-Sep-11	
	21-Sep-11	
	21-Sep-11	

Table 3.9: Calculation of Bat Mortality Rates of Group A WTG (5.5m/s) during trial period (July 15 – Sept 30)

	c	Ps	Sc	Se	C (bats)
July 15-30	3	0.363	0.644	0.805	15.94
August 1-30	0	0.363	0.618	0.814	0.00
September 1-30	2	0.363	0.526	0.794	13.19
Total	**5**				**29.13**
per turbine					**2.081**
per MW					**0.905**

Table 3.10: Calculation of Bat Mortality Rates of Group B WTG (4.5m/s) during trial period (July 15 – Sept 30)

	c	Ps	Sc	Se	C (bats)
July 15-30	2	0.434	0.644	0.805	8.89
August 1-30	4	0.434	0.618	0.814	18.32
September 1-30	2	0.434	0.526	0.794	11.03
Total	**8**				**38.24**
per turbine					**2.732**
per MW					**1.188**

Table 3.11: Calculation of Bat Mortality Rates of Group C WTG (control) during trial period (July 15 – Sept 30)

	c	Ps	Sc	Se	C (bats)
July 15-30	0	0.206	0.644	0.805	0.00
August 1-30	4	0.206	0.618	0.814	38.60
September 1-30	3	0.206	0.526	0.794	34.87
Total	**7**				**73.47**
per turbine					**5.248**
per MW					**2.282**

Table 3.12: Calculation of Bat Mortality Rates at trial turbines (Groups A, B and C) from July 1-14 and October 1-15

	c	Ps	Sc	Se	C (bats)
Group A – July 1-15	0	0.363	0.644	0.805	0.00
Group A – Oct 1-15	0	0.363	0.526	0.805	0.00
Group B – July 1-15	1	0.434	0.644	0.805	4.44
Group B – Oct 1-15	3	0.434	0.562	0.805	15.28
Group C – July 1-15	1	0.206	0.644	0.805	9.36
Group C – Oct 1-15	0	0.206	0.562	0.805	0.00
Total	**5**				**29.09**
per turbine					**0.693**
per MW					**0.301**

Table 3.13: Calculation of Bat Mortality Rates of other 44 turbines not used in trial.

	c	Ps	Sc	Se	C (bats)
44 Turbines not used in Trial – July 1-30 (1x weekly)	3	0.322	0.538	0.805	21.51
44 Turbines not used in Trial – August 1-30 (1x weekly)	14	0.322	0.556	0.814	96.07
44 Turbines not used in Trial – September 1-30 (1x weekly)	8	0.322	0.176	0.794	177.79
44 Turbines not used in Trial – October 1-15 (2x weekly)	1	0.336	0.562	0.805	6.58
44 Turbines not used in Trial – October 1-15 (1x weekly)	1	0.332	0.176	0.805	21.26
Total	**27**				**323.20**
per turbine					**7.350**
per MW					**3.194**

Note: Each of the 44 turbines not used in the trial were searched once weekly, with the exception of T86 which was searched twice weekly. Twice weekly calculations are provided for October only; the only month in which a fatality at T86 was recorded.

Table 3.14: Overall Summary for July to December 2011

	C (bats)	per turbine	per MW
Group A (5.5 m/s)	29.13	2.081	0.905
Group B (4.5 m/s)	38.24	2.732	1.188
Group C (control)	73.47	5.248	2.282
Groups A, B and C outside of Trial period	29.09	0.693	0.301
44 Turbines not used in Trial	323.20	7.350	3.194
Total (July to December 2011)	**493.13**	**5.734**	**2.493**

Table 3.15: Comparison of Waterfowl Use by Sector during fall season

	1999	2008	2009	2010	2011	% Change Pre (2008) to Post (2011) Construction
C7	162,950	218,493	362,157	330,136	326,173	49%
C8	121,671	138,282	268,080	166,597	188,380	36%
C9	1,516,131	972,487	1,124,403	639,528	875,018	-10%
C10	385,273	661,222	361,809	539,631	392,013	-41%
C11	402,668	244,219	244,517	210,602	187,080	-23%
Total	**2,588,692**	**2,234,702**	**2,360,965**	**1,886,494**	**1,968,663**	**-12%**

Notes: Cells represent waterfowl days.

Table 3.16: Comparison of Waterfowl Use by Staging Area during fall season

	2008	2009	2010	2011	% Change Pre (2008) to Post (2011) Construction
Bayfield	655,080	954,431	472,637	721,322	10%
Button	413,060	163,118	296,770	189,083	-54%
Pyke's	118,302	126,029	96,376	42,555	-64%
Reed's	63,261	117,659	60,918	51,956	-18%
Total	**1,249,702**	**1,361,236**	**926,700**	**1,004,916**	**-20%**

Notes: Cells represent waterfowl days.

Table 3.17: Comparison of Waterfowl Use by Guild during fall season

	1999	2008	2009	2010	2011	% Change Pre (2008) to Post (2011) Construction
Swans	9,484	20,960	30,338	26,180	33,578	60%
Geese	496,794	390,868	391,859	308,948	282,872	-28%
Large dabblers	762,557	354,443	340,805	292,984	325,185	-8%
Small dabblers	47,190	132,761	25,988	32,927	13,574	-90%
Bay ducks	1,153,076	1,139,233	1,459,697	854,554	1,112,723	-2%
Sea ducks	333	85	6,664	5,276	3,979	4581%
Goldeneye	75,595	137,951	69,564	211,813	133,761	-3%
Mergansers	43,665	58,403	36,052	150,455	62,992	8%
Total	**2,588,692**	**2,234,702**	**2,360,965**	**1,886,494**	**1,968,663**	**-12%**

Notes: Cells represent waterfowl days.

Table 3.18: Winter Raptor Survey Results, November-December 2006 and 2011

	2006					2011				
Species	**20-Nov-06**	**28-Nov-06**	**5-Dec-06**	**19-Dec-06**	**Total**	**7-Nov-11**	**23-Nov-11**	**5-Dec-11**	**19-Dec-11**	**Total**
Snowy Owl		1	4	1	6			3	8	11
Short-eared Owl			3		3		1	7		8
Turkey Vulture					0		1			1
Bald Eagle	1				1			2		2
Northern Harrier	10	21	25	31	87	14	16	9	10	49
Copper's Hawk					0					0
Red-tailed Hawk	10	11	10	12	43	7	5	7	3	22
Rough-legged Hawk	1	21	6	6	34	11	22	14	9	56
American Kestrel	1	5	8	6	20	3	6	4	2	15
Unidentified					0			1		1
Total Raptors	**23**	**59**	**56**	**56**	**194**	**35**	**51**	**47**	**32**	**165**
Total Kilometers	**42.3**	**65.1**	**63.3**	**65.4**	**236.1**	**74.0**	**72.5**	**69.5**	**70.5**	**289.5**
Density / Kilometer	**0.5**	**0.9**	**0.9**	**0.9**	**0.8**	**0.5**	**0.7**	**0.7**	**0.5**	**0.6**

Table 3.19: Short-eared Owl Survey Results, November-December 2006 and 2011

	2006					2011				
Species	**20-Nov-06**	**28-Nov-06**	**5-Dec-06**	**19-Dec-06**	**Total**	**7-Nov-10**	**23-Nov-10**	**5-Dec-10**	**19-Dec-10**	**Total**
Great Horned Owl					0					0
Snowy Owl				1	1					0
Short-eared Owl	5	5	5	17	32	2	22	29	10	63
Long-eared Owl					0					0
Total Short-eared Owls	**5**	**5**	**5**	**17**	**32**	**2**	**22**	**29**	**10**	**63**
Total Kilometers	**36**	**52.7**	**52.7**	**55.2**	**196.6**	**63.5**	**60.0**	**42.5**	**55.5**	**221.5**
Density / Kilometer	**0.1**	**0.1**	**0.1**	**0.3**	**0.2**	**0.03**	**0.4**	**0.7**	**0.2**	**0.3**

Table 3.20: Summary of Kingston Area Christmas Bird Count results from 2000-2011

	Number of Raptors per Party Hour											
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Great Horned Owl	0.04	0.14	0.09	0.06	0.14	0.06	0.08	N/A	0.04	0.06	0.06	0.06
Snowy Owl	0.09	0.07	0.06	0.01	0.03	0.03	0.06	N/A	0.09	0.07	0.01	0.13
Short-eared Owl	0.03	0.00	0.03	0.03	0.03	0.00	0.04	N/A	0.01	0.00	0.10	0.04
Bald Eagle	0.20	0.10	0.04	0.08	0.08	0.13	0.02	N/A	0.29	0.70	0.23	0.13
Northern Harrier	0.01	0.13	0.04	0.29	0.18	0.02	0.60	N/A	0.18	0.18	0.37	0.30
Sharp-shinned Hawk	0.03	0.03	0.03	0.01	0.03	0.05	0.04	N/A	0.03	0.05	0.03	0.01
Cooper's Hawk	0.05	0.04	0.03	0.02	0.01	0.06	0.02	N/A	0.03	0.02	0.01	0.01
Red-tailed Hawk	0.40	0.40	0.42	0.27	0.27	0.23	0.51	N/A	0.49	0.22	0.70	0.37
Rough-legged Hawk	0.11	0.14	0.02	0.43	0.08	0.06	0.18	N/A	0.18	0.08	0.71	0.34
American Kestrel	0.15	0.16	0.11	0.01	0.03	0.08	0.10	N/A	0.13	0.05	0.17	0.09
Merlin	0.04	0.02	0.01	0.00	0.01	0.03	0.02	N/A	0.02	0.02	0.02	0.01

N/A – data not available.

Table 3.21: Summary of Notifications - Reporting Period

Notification No.	Date	Period	Notification
1	July 6	May 23 – July 1	High Annual Mortality – Raptors
2	July 20	July 13 – July 20	Mortality of Species at Risk
3	August 8	July 29	Mortality of Species at Risk
4	August 31	August 22	Mortality of Species at Risk

Appendix C

Search Schedule

SUBSET	Monday	Tuesday	Wednesday	Thursday	Friday
Subset A – Turbine searched once weekly		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 – Turbines searched twice weekly	(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

Survey Date	Personnel	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
1-Jul-11	CF	30	3-4	Partly			12:10 PM	2:45 PM
1-Jul-11	WS						6:12 AM	9:10 AM
4-Jul-11	WS						6:53 AM	9:35 AM
4-Jul-11	CF	27	3-4	None			12:05 PM	3:06 PM
5-Jul-11	WS						6:50 AM	9:19 AM
5-Jul-11	CF	25	3-4	Partly			12:10 PM	2:36 PM
6-Jul-11	CF	24	4	Overcast			11:05 AM	1:39 PM
6-Jul-11	WS						6:43 AM	11:34 AM
7-Jul-11	CF	26	2-4	Partly			12:30 PM	3:25 PM
7-Jul-11	WS						6:30 AM	8:56 AM
8-Jul-11	CF	25	2-4	Partly			9:10 AM	11:45 AM
8-Jul-11	JL	23	0-1	None			9:18 AM	12:00 PM
11-Jul-11	CF	31	3-4	Partly			1:24 PM	4:22 PM
11-Jul-11	JL	26	1-4	Partly			10:19 AM	1:33 PM
12-Jul-11	CF	29	3-4	Partly			11:10 AM	1:43 PM
12-Jul-11	RD	27		Partly			7:00 AM	10:49 AM
13-Jul-11	WS						6:37 AM	9:48 AM
13-Jul-11	CF	18	3-4	Partly			12:34 PM	4:17 PM
14-Jul-11	CF	26	3-4	Partly			11:20 AM	4:42 PM
14-Jul-11	WS						7:40 AM	10:41 AM
15-Jul-11	CF	30	2-4	None			1:04 PM	3:56 PM
15-Jul-11	WS						7:36 AM	10:04 AM
18-Jul-11	CF	26	4	Overcast			11:10 AM	2:14 PM
18-Jul-11	JL	23	2-4	Overcast			8:38 AM	11:40 AM
19-Jul-11	JL	22	2-4	Partly			9:15 AM	11:30 AM
19-Jul-11	CF	23	2-4	Partly			9:11 AM	11:40 AM
20-Jul-11	CF	29	3-4	Partly			9:12 AM	12:00 PM
20-Jul-11	WS						6:22 AM	9:35 AM
21-Jul-11	WS						6:26 AM	9:07 AM
21-Jul-11	CF	31	4	None			11:20 AM	2:23 PM
22-Jul-11	CF	32	2-4	Partly			10:21 AM	1:36 PM
22-Jul-11	WS						6:56 AM	10:17 AM
25-Jul-11	RD	26		None			12:02 PM	5:35 PM
25-Jul-11	CF	23	3-4	Overcast			10:19 AM	1:22 PM
26-Jul-11	RD	27		None			10:55 AM	1:36 PM
26-Jul-11	CF	23	3-4	Partly			10:10 AM	1:03 PM
27-Jul-11	CF	25	1-3	Partly			10:20 AM	1:19 PM
27-Jul-11	JL	25	1-2	Partly			10:25 AM	1:15 PM
28-Jul-11	CF	26	3-4	Overcast			12:20 PM	3:01 PM
28-Jul-11	JL	27	3-4	Partly	Periodic Light Rain		12:40 PM	7:01 PM
29-Jul-11	WS						6:59 AM	9:44 AM
29-Jul-11	CF	23	3-4	Overcast	Heavy Rain / T-Storms		10:10 AM	11:12 AM
1-Aug-11	CF	30	3-4	Partly			11:10 AM	2:13 PM
1-Aug-11	WS						6:23 AM	9:27 AM
2-Aug-11	CF	29	2-4	Partly			11:20 AM	1:40 PM
2-Aug-11	WS						6:27 AM	9:03 AM
3-Aug-11	CF	26	3-4	Overcast			11:26 AM	2:11 PM
3-Aug-11	WS						6:19 AM	9:26 AM
4-Aug-11	CF	27	3-4	Partly			11:15 AM	1:57 PM
4-Aug-11	WS						7:26 AM	10:16 AM
5-Aug-11	WS						7:18 AM	10:06 AM
5-Aug-11	CF	28	1-4	Partly			12:05 PM	6:16 PM
8-Aug-11	JL	23	2-3	Overcast			9:14 AM	12:20 PM
8-Aug-11	WS						7:11 AM	10:23 AM
9-Aug-11	RD	27		Partly			8:13 AM	10:49 AM
9-Aug-11	RD	27		Partly			8:00 AM	1:17 PM
10-Aug-11	RD	26		Partly			12:00 PM	3:28 PM
10-Aug-11	JL	25	6	Overcast	Light Rain	Yes	2:50 PM	5:55 PM
11-Aug-11	JL	21	4-5	Overcast			11:10 AM	2:09 PM
11-Aug-11	WS						8:32 AM	11:30 AM
12-Aug-11	RD	28		None			3:00 PM	6:14 PM
12-Aug-11	WS						7:58 AM	10:25 AM

Survey Date	Personnel	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
15-Aug-11	CF	22	2-4	Overcast			11:10 AM	2:15 PM
15-Aug-11	WS						7:12 AM	9:47 AM
16-Aug-11	WS						7:26 AM	9:46 AM
16-Aug-11	CF	25	2-4	Partly			10:11 AM	1:09 PM
17-Aug-11	RD	27		None			8:00 AM	12:00 PM
17-Aug-11	CF	26	1-3	None			9:12 AM	12:18 PM
18-Aug-11	RD	26		Hazy			7:00 AM	2:51 PM
18-Aug-11	CF	24	2-4	None			8:05 AM	1:46 PM
19-Aug-11	WS						7:14 AM	10:33 AM
19-Aug-11	CF	28	2-4	Partly			11:15 AM	2:02 PM
22-Aug-11	CF	25	3-4	Partly			11:14 AM	2:17 PM
22-Aug-11	WS						7:39 AM	10:25 AM
23-Aug-11	WS						8:06 AM	10:18 AM
23-Aug-11	CF	22	2-4	Partly			9:04 AM	12:30 PM
24-Aug-11	JL	24	6	Partly			10:15 AM	1:27 PM
24-Aug-11	CF	23	4-6	Partly			10:07 AM	1:19 PM
25-Aug-11	CF	24	3-4	Partly			11:10 AM	2:01 PM
25-Aug-11	WS						8:07 AM	5:18 PM
26-Aug-11	WS						8:55 AM	11:41 AM
26-Aug-11	CF	21	2-4	Partly			10:20 AM	1:12 PM
29-Aug-11	CF	21	3-4	Partly			11:22 AM	2:27 PM
29-Aug-11	WS						7:48 AM	10:40 AM
30-Aug-11	CF	24	3-4	None			10:10 AM	12:55 PM
30-Aug-11	WS						7:38 AM	10:12 AM
31-Aug-11	CF	24	1-4	Partly			10:18 AM	3:51 PM
31-Aug-11	WS						8:09 AM	11:15 AM
1-Sep-11	RD	25					3:00 PM	6:27 PM
1-Sep-11	CF	24	2-4	Partly			12:40 PM	3:30 PM
2-Sep-11	CF	23	2-4	Partly			11:09 AM	2:03 PM
2-Sep-11	WS						7:06 AM	9:47 AM
5-Sep-11	CF	17	3-4	Partly			12:05 PM	2:05 PM
5-Sep-11	JL	18		Partly			5:04 PM	7:03 PM
5-Sep-11	WS						9:14 AM	11:15 AM
6-Sep-11	CF	21	3-4	Partly			12:28 PM	2:47 PM
6-Sep-11	WS						8:17 AM	11:16 AM
7-Sep-11	WS						7:24 AM	10:28 AM
7-Sep-11	CF	16	3-4	Overcast	Rain	Rain	12:05 PM	3:10 PM
8-Sep-11	CF	20	3-4	Overcast			11:20 AM	1:57 PM
8-Sep-11	WS						8:00 AM	11:24 AM
9-Sep-11	CF	23	1-3	Partly			11:05 AM	1:56 PM
9-Sep-11	JL	18	2	Partly			7:40 AM	10:22 AM
12-Sep-11	CF	24	3-4	Partly			12:09 PM	2:57 PM
12-Sep-11	WS						8:05 AM	11:09 AM
13-Sep-11	WS						8:42 AM	11:28 AM
13-Sep-11	CF	26	4-6+	Partly			12:13 PM	3:10 PM
14-Sep-11	JL	11	2	Partly			6:55 AM	9:27 AM
14-Sep-11	CF	20	2-4	Partly			10:05 AM	1:11 PM
15-Sep-11	JL	11		Overcast			10:15 AM	11:49 AM
15-Sep-11	CF	14	2-4	Partly			11:21 AM	12:40 PM
15-Sep-11	WS						9:09 AM	12:01 PM
16-Sep-11	CF	13	3-4				10:10 AM	1:00 PM
16-Sep-11	WS						8:17 AM	10:51 AM
19-Sep-11	CF	20	4-6	Partly			12:01 PM	2:19 PM
19-Sep-11	RD	24		Partly			2:00 PM	5:30 PM
19-Sep-11	JL	21		Overcast			2:41 PM	4:11 PM
20-Sep-11	CF			Partly			11:08 AM	2:06 PM
20-Sep-11	RD	23		Overcast			1:30 PM	5:00 PM
21-Sep-11	CF	19	2-4	Partly			9:15 AM	11:52 AM
21-Sep-11	WS						8:17 AM	11:19 AM
22-Sep-11	RD	22		Overcast			3:00 PM	6:20 PM
22-Sep-11	WS						9:24 AM	12:36 PM
23-Sep-11	WS						8:47 AM	11:25 AM

Survey Date	Personnel	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
23-Sep-11	JL	17	2-3	Overcast			9:03 AM	10:52 AM
23-Sep-11	CF	17	2-4	Overcast			9:02 AM	10:59 AM
26-Sep-11	WS						8:38 AM	11:39 AM
26-Sep-11	CF	22	3-4	Partly			10:10 AM	11:45 AM
27-Sep-11	WS						8:11 AM	10:36 AM
27-Sep-11	CF	26	1-3	Overcast			12:06 PM	3:02 PM
28-Sep-11	CF	24	3-4	Overcast	Light Rain		11:10 AM	12:28 PM
28-Sep-11	WS						9:37 AM	12:39 PM
29-Sep-11	CF	20	2-4	Overcast			9:12 AM	10:52 AM
29-Sep-11	RD	21		Overcast	Rain		8:45 AM	5:39 PM
29-Sep-11	JL	19		Overcast			9:14 AM	10:53 AM
30-Sep-11	CF	18	4-6	Overcast	Light Rain		9:08 AM	11:57 AM
30-Sep-11	WS						8:44 AM	11:39 AM
3-Oct-11	WS						8:16 AM	11:25 AM
3-Oct-11	CF	16	2-4	Overcast			2:30 PM	4:00 PM
3-Oct-11	JL	12	2-3	Overcast			8:30 AM	10:10 AM
4-Oct-11	CF	15	2-4	Overcast			10:08 AM	11:28 AM
4-Oct-11	JL	13	2-3	Overcast			7:45 AM	8:51 AM
4-Oct-11	WS						8:12 AM	10:53 AM
5-Oct-11	RD	18					3:00 PM	6:36 PM
5-Oct-11	CF	17	4	None			10:40 AM	1:51 PM
6-Oct-11	RD						11:20 AM	3:24 PM
6-Oct-11	CF	18	1-3	Partly			10:08 AM	1:03 PM
7-Oct-11	CF	19	2-4	None			10:10 AM	11:38 AM
7-Oct-11	JL	19	2-4	None			9:15 AM	10:47 AM
7-Oct-11	WS						9:41 AM	12:13 PM
10-Oct-11	WS						9:17 AM	5:28 PM
10-Oct-11	CF	24	2-4	None			12:17 PM	3:19 PM
11-Oct-11	WS						8:16 AM	10:50 AM
11-Oct-11	CF	19	2-4	None			10:04 AM	12:47 PM
12-Oct-11	CF	16	2-4				9:05 AM	12:06 PM
12-Oct-11	JL	12		Overcast			7:00 AM	10:05 AM
13-Oct-11	CF	15	2-4	Overcast			9:17 AM	12:38 PM
13-Oct-11	JL	13					8:05 AM	12:27 PM
14-Oct-11	CF	22	4-6	Partly			10:04 AM	12:55 PM
14-Oct-11	RD	20					9:00 AM	12:53 PM
17-Oct-11	JL	12	6+	Overcast			8:27 AM	11:02 AM
17-Oct-11	RD	15					9:48 AM	1:49 PM
17-Oct-11	CF	11	6+	Overcast			9:25 AM	10:59 AM
18-Oct-11	JL	11	6+	Overcast			7:14 AM	10:22 AM
18-Oct-11	CF	12	6+	Overcast			8:00 AM	10:48 AM
19-Oct-11	WS						9:21 AM	2:42 PM
19-Oct-11	CF	12	6+	Overcast			10:05 AM	1:40 PM
20-Oct-11	WS						8:36 AM	11:45 AM
20-Oct-11	CF	12	6	Overcast	Rain	Rain	11:09 AM	2:16 PM
21-Oct-11	JL	11	6	Overcast			9:10 AM	10:41 AM
21-Oct-11	CF	12	6	Overcast			2:50 PM	4:05 PM
21-Oct-11	WS						8:17 AM	10:53 AM
24-Oct-11	RD	15					1:00 PM	5:01 PM
24-Oct-11	CF	14	4-6	Overcast			10:04 AM	1:13 PM
25-Oct-11	RD	11					2:00 PM	5:27 PM
25-Oct-11	CF	10	4-6	Partly			10:04 AM	1:10 PM
26-Oct-11	JL	6					7:41 AM	9:01 AM
26-Oct-11	CF	11	2-4	Overcast			9:04 AM	10:39 AM
26-Oct-11	WS						8:46 AM	11:29 AM
27-Oct-11	WS						10:00 AM	12:45 PM
27-Oct-11	CF	4	4-6	Overcast			9:41 AM	11:57 AM
27-Oct-11	JL	4	4-6	Overcast			9:42 AM	11:25 AM
28-Oct-11	CF	5	3-4	Partly			7:50 AM	10:32 AM
28-Oct-11	WS						9:00 AM	11:35 AM
31-Oct-11	JL	7	4	None			9:10 AM	10:46 AM
31-Oct-11	WS						8:42 AM	11:41 AM

Survey Date	Personnel	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
31-Oct-11	CF	8	2-4	None			9:08 AM	10:57 AM
1-Nov-11	WS						8:57 AM	11:44 AM
1-Nov-11	CF	10	2-4	Overcast			10:12 AM	12:44 PM
2-Nov-11	WS						9:07 AM	12:13 PM
2-Nov-11	CF	14	4-6	Partly			2:37 PM	4:55 PM
3-Nov-11	JL	11	4-6	Partly			8:11 AM	10:41 AM
3-Nov-11	JL	14	4-6	Partly			2:38 PM	4:49 PM
3-Nov-11	CF	13	4-6	Partly			9:05 AM	10:52 AM
3-Nov-11	WS						8:24 AM	11:15 AM
4-Nov-11	RD	5		None			10:00 AM	1:25 PM
4-Nov-11	CF	10	3-4				9:10 AM	11:47 AM
7-Nov-11	CF	14	4-6	Overcast			10:15 AM	12:15 PM
7-Nov-11	WS						8:30 AM	11:25 AM
7-Nov-11	JL	14		Overcast			10:16 AM	12:30 PM
8-Nov-11	WS						8:14 AM	10:36 AM
8-Nov-11	JL	13	1-2	Overcast			3:04 PM	4:49 PM
8-Nov-11	CF	13	1-2	Overcast			2:49 PM	4:48 PM
9-Nov-11	CF	14	4-6	Partly			9:15 AM	11:02 AM
9-Nov-11	WS						8:26 AM	11:27 AM
9-Nov-11	JL	13	4-5	None			8:57 AM	11:03 AM
10-Nov-11	CF	10	4-6	Partly			12:12 PM	3:15 PM
10-Nov-11	RD	9					2:00 PM	4:55 PM
11-Nov-11	WS						7:46 AM	10:29 AM
11-Nov-11	CF	7	4-6	Partly			12:20 PM	2:17 PM
11-Nov-11	JL	6					12:29 PM	2:18 PM
14-Nov-11	CF	15	4-6	Overcast			12:21 PM	3:19 PM
14-Nov-11	WS						8:15 AM	10:55 AM
15-Nov-11	WS						8:17 AM	11:04 AM
15-Nov-11	CF	11	4				8:00 AM	10:50 AM
16-Nov-11	CF	13	4-6	Overcast			9:25 AM	11:43 AM
16-Nov-11	JL	13	4-6	Overcast			9:42 AM	11:57 AM
16-Nov-11	WS						8:22 AM	10:51 AM
17-Nov-11	CF	4	4	Partly			9:22 AM	11:11 AM
17-Nov-11	JL	6	4-6	Partly			9:23 AM	11:40 AM
17-Nov-11	WS						8:13 AM	10:58 AM
18-Nov-11	CF	5	4	Partly			9:08 AM	11:54 AM
18-Nov-11	WS						8:21 AM	10:59 AM
21-Nov-11	JL	2	2	None			1:18 PM	5:00 PM
21-Nov-11	CF	2	2-4				1:17 PM	4:47 PM
22-Nov-11	JL	2	3-4	Overcast			12:59 PM	4:25 PM
22-Nov-11	CF	3	3-4	Overcast			12:45 PM	4:24 PM
23-Nov-11	WS						9:00 AM	11:27 AM
23-Nov-11	CF	2	2-4	Overcast			12:11 PM	3:16 PM
24-Nov-11	WS						8:25 AM	10:46 AM
24-Nov-11	CF	8	2-4	Overcast			9:13 AM	12:01 PM
25-Nov-11	WS						10:13 AM	12:39 PM
25-Nov-11	CF	10	4-6	Partly			11:37 AM	1:31 PM
25-Nov-11	JL	10	4-6	Overcast			11:23 AM	1:14 PM
28-Nov-11	RD				Yes	Yes	9:30 AM	3:40 PM
28-Nov-11	CF	10	2-4	Partly			11:10 AM	2:09 PM
29-Nov-11	WS						8:13 AM	10:50 AM
29-Nov-11	CF	6	3-4	Overcast			11:24 AM	1:55 PM
30-Nov-11	CF	4	4-5	Overcast			2:41 PM	4:21 PM
30-Nov-11	JL	4	4-6	Overcast	Light Rain		2:48 PM	4:11 PM
30-Nov-11	WS						9:15 AM	11:57 AM
1-Dec-11	WS						8:52 AM	11:54 AM
1-Dec-11	JL	0	1-2	None			9:13 AM	10:56 AM
1-Dec-11	CF	1	2-4	Partly			9:12 AM	11:08 AM
2-Dec-11	CF	3	2-4	Overcast			11:10 AM	1:53 PM
2-Dec-11	WS						8:57 AM	11:22 AM
5-Dec-11	WS						9:15 AM	12:46 PM
5-Dec-11	CF	8	4	Overcast			9:13 AM	11:28 AM

Survey Date	Personnel	Temp (° C)	Wind Speed	Cloud	PPT	Overnight PPT	Start Time	End Time
5-Dec-11	JL	8	4	Overcast	Rain		9:29 AM	11:29 AM
6-Dec-11	CF	2	4-5	Overcast			10:13 AM	12:22 PM
6-Dec-11	WS						9:04 AM	11:43 AM
6-Dec-11	JL	3		Overcast			10:28 AM	12:07 PM
7-Dec-11	CF	2	1-2	Overcast			9:24 AM	12:27 PM
7-Dec-11	JL	2	2	Overcast			9:22 AM	12:20 PM
8-Dec-11	WS						8:58 AM	12:00 PM
8-Dec-11	CF	3	5-6	None			10:22 AM	1:20 PM
9-Dec-11	CF	2	4-6	Overcast	Wet Snow		9:11 AM	12:58 PM
9-Dec-11	WS						8:20 AM	10:56 AM
12-Dec-11	WS						8:27 AM	10:45 AM
12-Dec-11	CF	7	3-4	None			12:25 PM	2:49 PM
13-Dec-11	WS						8:21 AM	10:40 AM
13-Dec-11	CF	5	2-4	Overcast	Light Rain		12:15 PM	2:57 PM
14-Dec-11	WS						9:04 AM	11:12 AM
14-Dec-11	CF	7	2-4	Partly			10:10 AM	12:30 PM
15-Dec-11	RD	8		Overcast	Rain (sometimes Heavy)	Rain	12:00 PM	2:30 PM
15-Dec-11	JL	8	6+	Overcast	Rain		10:26 AM	12:11 PM
15-Dec-11	CF	8	6+	Overcast	Heavy Rain	Heavy Rain	10:25 AM	11:56 PM
19-Dec-11	WS						9:03 AM	11:25 AM
19-Dec-11	CF	6	6	Overcast			12:20 PM	2:48 PM
20-Dec-11	WS						9:01 AM	11:33 AM
20-Dec-11	CF	-4	3-4	Partly			11:05 AM	1:18 PM
21-Dec-11	CF	7	3-4	Overcast	Rain		1:05 PM	3:20 PM
21-Dec-11	RD	7		Overcast	Light Rain		1:20 PM	4:01 PM
22-Dec-11	WS						1:28 PM	3:41 PM
22-Dec-11	CF	3	3-4				10:20 AM	12:31 PM
26-Dec-11	CF	3	2-4	Overcast			1:07 PM	3:33 PM
26-Dec-11	WS						8:58 AM	11:13 AM
27-Dec-11	WS						8:51 AM	11:13 AM
27-Dec-11	CF	6	4-6	Overcast			12:05 PM	2:40 PM
28-Dec-11	WS						8:06 AM	10:24 AM
28-Dec-11	CF	-7	3-4	Overcast			12:11 PM	2:35 AM
29-Dec-11	CF	-12	1-2	Partly			10:23 AM	12:36 PM
29-Dec-11	WS						8:07 AM	9:10 AM
30-Dec-11	WS						9:15 AM	10:06 AM

Survey Date	Survey Type	Weather	Wind direction	Start Time	End Time
9-Nov-10	Winter Raptor	Temp: 7ºC Wind: 2-3 Cloud: 50% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	2:30 PM	4:40 PM
9-Nov-10	Winter Raptor	Temp: 9ºC Wind: 1 Cloud: 60% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	2:30 PM	4:40 PM
25-Nov-10	Winter Raptor	Temp: -3ºC Wind: 4-5 Cloud: 100% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	2:40 PM	4:00 PM
25-Nov-10	Winter Raptor	Temp: -2ºC Wind: 3 Cloud: 100% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	2:30 PM	4:00 PM
8-Dec-10	Winter Raptor	Temp: -6 to -7ºC Wind: 3 Cloud: 30-50% PPT: None Overnight ppt or fog: Flurries Average snow depth: 1-3 cm	WNW	2:30 PM	4:10 PM
8-Dec-10	Winter Raptor	Temp: -6 to -7ºC Wind: 3 Cloud: 30-50% PPT: None Overnight ppt or fog: Flurries Average snow depth: 1-3 cm	WNW	2:30 PM	4:10 PM
21-Dec-10	Winter Raptor	Temp: -1ºC Wind: 1 Cloud: 35% PPT: None Overnight ppt or fog: None Average snow depth: 3 cm	West	2:25 PM	3:55 PM
21-Dec-10	Winter Raptor	Temp: -4ºC Wind: 2 Cloud: 80% PPT: None Overnight ppt or fog: None Average snow depth: 1 cm	North	2:25 PM	3:55 PM
9-Nov-10	Short-eared Owl	Temp: 5ºC Wind: 2 Cloud: 95% PPT: None Overnight ppt or fog: None Average snow depth: 0		4:40 PM	5:20 PM
9-Nov-10	Short-eared Owl	Temp: 8ºC Wind: 1 Cloud: 90% PPT: None Overnight ppt or fog: None Average snow depth: 0		4:30 PM	5:20 PM
25-Nov-10	Short-eared Owl	Temp: -3ºC Wind: 1-2 Cloud: 100% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	4:00 PM	5:30 PM
25-Nov-10	Short-eared Owl	Temp: -3ºC Wind: 1 Cloud: 100% PPT: None Overnight ppt or fog: None Average snow depth: 0	East	4:00 PM	5:30 PM
8-Dec-10	Short-eared Owl	Temp: -5ºC Wind: 2 Cloud: 30% PPT: None Overnight ppt or fog: None Average snow depth: 5 cm	NW	3:45 PM	5:00 PM
8-Dec-10	Short-eared Owl	Temp: -4 to -7ºC Wind: 3 Cloud: 30-50% PPT: None Overnight ppt or fog: Flurries Average snow depth: 1-3 cm	NW	3:55 PM	5:15 PM
21-Dec-10	Short-eared Owl	Temp: -6ºC Wind: 2 Cloud: 10% PPT: None Overnight ppt or fog: None Average snow depth: 0	North	4:30 PM	5:15 PM
21-Dec-10	Short-eared Owl	Temp: -3ºC Wind: 0 Cloud: 25% PPT: None Overnight ppt or fog: None Average snow depth: 3 cm	n/a	4:00 PM	5:00 PM
7-Sep-10	Waterfowl Aerial	Temp: 23-26ºC Wind: 4-5+ Cloud: 15-60% PPT: None Overnight ppt or fog: Light shower	SW	5:15 PM	6:05 PM
20-Sep-10	Waterfowl Aerial	Temp: 17ºC Wind: 2 Cloud: 20% PPT: None Overnight ppt or fog: None		3:25 PM	4:15 PM
4-Oct-10	Waterfowl Aerial	Temp: 12ºC Wind: 3 Cloud: 90% PPT: Very light rain Overnight ppt or fog: Rain		1:20 PM	2:10 PM

Survey Date	Survey Type	Weather	Wind direction	Start Time	End Time
13-Oct-10	Waterfowl Aerial	Temp: 16ºC Wind: 3-4 Cloud: 5% PPT: None Overnight ppt or fog: None		4:00 PM	4:55 PM
1-Nov-10	Waterfowl Aerial	Temp: 5ºC Wind: 1 Cloud: 30% PPT: None Overnight ppt or fog: Flurries		1:55 PM	2:40 PM
15-Nov-10	Waterfowl Aerial	Temp: 12ºC Wind: 2-3 Cloud: 0-80% PPT: None Overnight ppt or fog: None		1:50 PM	2:45 PM
3-Dec-10	Waterfowl Aerial	Temp: 3ºC Wind: 1 Cloud: 60% PPT: None Overnight ppt or fog: None		10:25 AM	11:20 AM
15-Dec-10	Waterfowl Aerial	Temp: -8ºC Wind: 3-4 Cloud: 20% PPT: None Overnight ppt or fog: Flurries		1:20 PM	2:05 PM
10-Jan-11	Waterfowl Aerial	Temp: -7ºC Wind: 1-2 Cloud: 5% PPT: None Overnight ppt or fog: None		1:15 PM	1:50 PM

Appendix E

Fatality Summary

Fatality Summary: Bats

Date	Turbine #	GPS Location Zone Easting Northing	Observer	Species	Guild	Condition/Estimated Time Since Death	Injuries Sustained	Distance (m)	Direction (°)	Ground Cover
06-Jul-11	80	0384268 4889949	CF	Hoary Bat	bat	Fresh, 1-2 days	Vortex?	9	210	Gravel
11-Jul-11	85	0381916 4892259	JL	Hoary Bat	bat	Fresh, < 1 day	Vortex	27	270	Gravel
11-Jul-11	82	0383100 4893035	JL	Big Brown Bat	bat	Fresh, < 1 day	Vortex	25	270	Gravel
15-Jul-11	61	0389997 4894134	CF	Big Brown Bat	bat	Fresh, 1-2 days	Wing	11	91	Gravel
15-Jul-11	39	0387312 4887586	WS	Hoary Bat	bat	Fresh, < 5 days		18	237	Soil
20-Jul-11	29	0384727 4886853	CF	Big Brown Bat	bat	Fresh, 1 day	Broken Foot	16	40	Gravel
22-Jul-11	51	0387737 4890496	CF	Red Bat	bat	Old, 2-3 days	Vortex?	22	256	Gravel
25-Jul-11	36	0388873 4887357	RD	Hoary Bat	bat	Fresh, 1 day	No visible trauma	13	20	Gravel
27-Jul-11	58	0389421 4892158	CF	Red Bat	bat	Fresh, 1-2 days	Vortex?	43	300	Gravel
28-Jul-11	36	0388857 4887338	CF	Hoary Bat	bat	Old, 2-3 days	Vortex?	6	124	Vegetation
01-Aug-11	46	0389903 4890717	WS	Hoary Bat	bat	Fresh, < 3 days	No visible trauma	13	132	Gravel
01-Aug-11	34	0384090 4887326	WS	Hoary Bat	bat	Old, > 5 days	No visible trauma	50	243	Gravel
03-Aug-11	60	0388809 4893037	WS	Hoary Bat	bat	Old, > 5 days		33	243	Gravel
03-Aug-11	59	0389132 1892807	WS	Hoary Bat	bat	Old, > 5 days		9	126	Gravel
03-Aug-11	59	0389114 4892821	WS	Hoary Bat	bat	Old, > 5 days		18	113	Gravel
05-Aug-11	38	0387266 4888063	CF	Big Brown Bat	bat	Fresh, 1-2 days	Abdomen?	16	95	Gravel
08-Aug-11	35	0384268 4887833	JL	Big Brown Bat	bat	Fresh, 1 day		15	323	Gravel
08-Aug-11	37	0388791 4887756	JL	Hoary Bat	bat	Old, 3 days		45	18	Gravel
10-Aug-11	5	0380639 4890650	RD	Hoary Bat	bat	Fresh, hours	No visible trauma	1	160	Dirt
11-Aug-11	85	0381930 4892277	JL	Hoary Bat	bat	Fresh, < 1 day		37	255	Gravel
17-Aug-11	40	0388018 4887005	RD	Hoary Bat	bat	Fresh	Wings?	4	180	Dirt
17-Aug-11	41	0387611 4886748	RD	Bat Sp.	bat	Old	unknown	32	280	Gravel
17-Aug-11	41	0387583 4886723	RD	Red Bat	bat	Old, 4 days	unknown	0	164	Tower base
17-Aug-11	14	0382150 4890886	CF	Red Bat	bat	Fresh, 1-2 days	No visible trauma	46	71	Gravel
17-Aug-11	14	0382167 4890902	CF	Big Brown Bat	bat	Fresh, 1-2 days	Wing?	21	86	Gravel
18-Aug-11	74	0384479 4892954	CF	Hoary Bat	bat	Fresh, 1 day	Vortex?	34	265	Gravel
22-Aug-11	65	0387706 4892940	WS	Hoary Bat	bat	Fresh, < 3 days		17	164	Gravel
24-Aug-11	22	0382257 4889673	JL	Hoary Bat	bat	Old, 3 days		12	45	Gravel
24-Aug-11	63	0388772 4893404	CF	Hoary Bat	bat	Fresh, 1-2 days	Vortex?	11	314	Gravel
26-Aug-11	38	0387272 4888048	WS	Red Bat	bat	Fresh, < 3 days	No visible trauma	12	60	Gravel
30-Aug-11	7	0380602 4889714	WS	Red Bat	bat	Old, > 5 days	unknown	31	346	Gravel
31-Aug-11	60	0388813 4893038	WS	Hoary Bat	bat	Old, > 5 days		29	265	Gravel
01-Sep-11	27	0382270 4891323	CF	Silver-haired Bat	bat	Old, 3-4 days	Vortex?	31	274	Gravel
01-Sep-11	73	0384286 4893410	CF	Silver-haired Bat	bat	Fresh, 1-2 days	Vortex?	1	21	Gravel
02-Sep-11	61	0389979 4894163	CF	Hoary Bat	bat	Fresh, 1-2 days	Vortex?	33	116	Gravel
05-Sep-11	82	0383116 4893040	WS	Hoary Bat	bat	Fresh, < 3 days		40	268	Gravel
07-Sep-11	31	0384872 4886149	WS	Hoary Bat	bat	Fresh, < 5 days		12	174	Gravel
12-Sep-11	85	0381909 4892268	CF	Silver-haired Bat	bat	Fresh, 1-2 days	Vortex?	18	257	Gravel
12-Sep-11	2	0380941 4891106	CF	Red Bat	bat	Fresh, 1-2 days	Vortex?	21	102	Gravel
12-Sep-11	42	0386295 4889070	CF	Silver-haired Bat	bat	Fresh, 1-2 days	Vortex?	20	30	Gravel
13-Sep-11	9	0380912 4890050	WS	Silver-haired Bat	bat	Fresh, < 5 days	No visible trauma	13	240	Gravel
14-Sep-11	41	0387605 4886749	JL	Hoary Bat	bat	Fresh, < 1 day	Vortex	32	240	Gravel
15-Sep-11	35	0384263 4887827	WS	Silver-haired Bat	bat	Fresh, < 5 days	No visible trauma	16	347	Gravel

Date	Turbine #	GPS Location Zone Easting Northing	Observer	Species	Guild	Condition/Estimated Time Since Death	Injuries Sustained	Distance (m)	Direction (°)	Ground Cover
21-Sep-11	48	0389180 4889694	CF	Silver-haired Bat	bat	Fresh, 1-2 days	Vortex?	11	206	Gravel
21-Sep-11	5	0380637 4890663	WS	Silver-haired Bat	bat	Fresh, < 5 days	No visible trauma	9	173	Gravel
27-Sep-11	11	0381558 4890000	WS	Red Bat	bat	Old, > 5 days		31	139	Gravel
27-Sep-11	66	0388126 4891452	CF	Hoary Bat	bat	Fresh, 1-2 days	Vortex	9	100	Gravel
03-Oct-11	85	0381916 4892274	WS	Big Brown Bat	bat	Fresh, < 3 days		28	270	Gravel
03-Oct-11	86	0382264 4892630	WS	Hoary Bat	bat	Old, > 5 days	No visible trauma	22	292	Gravel
04-Oct-11	69	0386228 4892218	WS	Big Brown Bat	bat	Old, < 5 days		26	60	Gravel
04-Oct-11	70	0386865 4893970	WS	Hoary Bat	bat	Fresh, < 3 days		23	50	Gravel
05-Oct-11	5	0388121 4891438	RD	Red Bat	bat	Fresh, 1		23	120	Gravel

Fatality Summary: Birds										
Date	**Turbine #**	**GPS Location Zone Easting Northing**	**Observer**	**Species**	**Guild**	**Condition/Estimated Time Since Death**	**Injuries Sustained**	**Distance (m)**	**Direction (°)**	**Ground Cover**
01-Jul-11	32	0385244 4886415	WS	Red-tailed Hawk	raptor	< 5 days		19	170	Gravel
04-Jul-11	62	0389707 4893969	CF	Ring-billed Gull	bird	Fresh, 1-2 days	Wing / Neck	10	125	Vegetation
12-Jul-11	68	0388766 4893397	RD	Bird sp.	bird	feathers only - no carcass		26	115	Grass
13-Jul-11	14	0382175 4890898	WS	Bobolink - Juv.	bird	Fresh	No visible trauma	1	164	Tower base
15-Jul-11	39	0387330 4887552	WS	Tree Swallow	bird	Fresh, < 5 days		22	249	Soil
20-Jul-11	79	0384850 4889380	WS	Bobolink - Juv.	bird	Fresh, < 3 days	No visible trauma	33	90	Gravel
21-Jul-11	37	0388795 4887796	WS	Eastern Kingbird	bird	Fresh, 3-5 days	No visible trauma	1	72	Gravel
21-Jul-11	75	0384547 4892648	CF	Tree Swallow	bird	Fresh, 1-2 days	Neck?	37	247	Gravel
28-Jul-11	33	0384459 4887262	CF	Purple Martin - Juv.	bird	Fresh, 1-2 days	Abdomen?	36	146	Gravel
29-Jul-11	15	0381597 4888235	WS	Bobolink - Juv.	bird	Fresh, < 5 days	No visible trauma			
03-Aug-11	3	0380633 4890663	CF	Yellow Warbler	bird	Fresh, 1-2 days	Neck	8	170	Gravel
05-Aug-11	18	0381646 4888722	CF	Savannah Sparrow	bird	Old, 2-3 days	Neck?	8	178	Gravel
09-Aug-11	51	0387746 4890477	RD	Northern Flicker	bird	Old, scavenged		18	280	Gravel
12-Aug-11	42	0386281 4889036	WS	American Crow	bird	Fresh, < 3 days	No visible trauma	49	22	Gravel
16-Aug-11	66	0388117 4891433	CF	Bird sp.	bird	Fresh, 1-2 days	Neck	23	48	Gravel
17-Aug-11	58	0389399 4892150	RD	Bird sp.	bird	Fresh, 2 days	broken neck	33	20	Gravel
17-Aug-11	14	0382167 4890905	CF	Cedar Waxwing	bird	Fresh, 1-2 days	Neck?	12	118	Gravel
18-Aug-11	33	0389409 4882148	RD	Bird sp.	bird	Old, 3 days	Neck	48	130	Gravel
18-Aug-11	46	0389915 4890687	CF	Brown-headed Cowbird	bird	Old, 2-4 days	Neck	1	190	Gravel
22-Aug-11	33	0384464 4887246	WS	Bobolink (juv. or female)	bird	Old, > 5 days		26	128	Gravel
29-Aug-11	44	0390351 4891145	WS	Red-tailed Hawk - Juv.	raptor	Fresh, < 5 days		5	4	Grass
01-Sep-11	74	0384482 4892949	CF	Purple Martin	bird	Fresh, 1-2 days	Abdomen Trauma	32	275	Gravel
02-Sep-11	69	0386221 4892224	CF	Bay-breasted Warbler	bird	Fresh, 1-2 days	Head trauma	37	83	Gravel
06-Sep-11	70	0386883 4893978	WS	Purple Martin - Juv.	bird	Fresh, < 5 days	No visible trauma	22	184	Gravel
07-Sep-11	41	0387602 4886739	CF	Cedar Waxwing	bird	Fresh, 1 day	Head / Neck	21	252	Gravel
19-Sep-11	65	0387707 4892942	CF	Bird sp.	bird	Fresh, 1-2 days	Vortex?	20	180	Gravel
20-Sep-11	49	0388610 4890439	CF	Lesser Yellowlegs	bird	Fresh, 1-2 days	Abdomen	38	156	Veg/Gravel
27-Sep-11	49	0388617 4890436	CF	Tree swallow	bird	Fresh, 1-2 days	Abdomen	35	148	Gravel
03-Oct-11	37	0388791 4887756	JL	Black-throated Blue Warbler	bird	Fresh, < 1 day	Neck	40	10	Gravel
06-Oct-11	76	0383916 4893055	RD	Bird sp.	bird	Skeletal - Old		10	2	Gravel
14-Oct-11	69	0386228 4892215	RD	Northern Parula	bird	Fresh, 1 day	Broken neck (?)	29	68	Gravel
31-Oct-11	85	0381909 4892277	WS	American Goldfinch	bird	Fresh, < 3 days	No visible trauma	43	273	Gravel
10-Nov-11	75	0384561 4892637	CF	European Starling	bird	Fresh, 1-2 days	Neck	48	270	Gravel
24-Nov-11	46	0389989 4890737	CF	Downy Woodpecker	bird	Fresh, 1-2 days	Head / Neck	14	184	Gravel
28-Nov-11	85	0381894 4892257	RD	Golden-crowned Kinglet	bird	Skeletal - very old		15	260	Grass
30-Nov-11	63	0389913 4890733	JL	Brown-headed Cowbird	bird	Fresh, 2-3 days	Neck	40	236	Gravel
20-Dec-11	42	0386318 4889133	WS	Red-tailed Hawk	raptor	Fresh (Frozen) < 5 days		9	264	Grass

Appendix F

Summary of Aerial Surveys

Aerial Waterfowl Survey Results by Sector

FALL 2011: **Waterfowl Days by guild for each of 5 Wolfe Island survey sectors**

	C7	C8	C9	C10	C11	Total
Swans	4,094	8591	10,800	5,231	4,862	33,578
Geese	41,380	9467	73,713	132,689	25,623	282,872
Large dabblers	35,322	42,352	126,500	68,892	52,120	325,185
Small dabblers	720	2690	9,248	191	725	13,574
Bay ducks	187,354	96,032	637,605	146,233	45,500	1,112,723
Sea ducks	162	3305	78	289	145	3,979
Goldeneye	34,986	12,222	8,166	31,500	46,888	133,761
Mergansers	22,156	13,721	8,910	6,989	11,217	62,992
Total	**326,173**	**188,380**	**875,018**	**392,013**	**187,080**	**1,968,663**

FALL 2010: **Waterfowl Days by guild for each of 5 Wolfe Island survey sectors**

	C7	C8	C9	C10	C11	Total
Swans	2,927	2,090	8,032	10,509	2,623	26,180
Geese	45,116	12,016	73,808	144,763	33,247	308,948
Large dabblers	25,797	26,969	130,887	53,994	55,338	292,984
Small dabblers	5,991	1,110	25,026	800	0	32,927
Bay ducks	141,190	48,898	374,865	254,726	34,875	854,554
Sea ducks	4,098	0	23	178	977	5,276
Goldeneye	56,938	29,821	15,741	60,064	49,250	211,813
Mergansers	45,681	45,695	10,188	14,599	34,293	150,455
Total	**330,136**	**166,597**	**639,528**	**539,631**	**210,602**	**1,886,494**

FALL 2009: **Waterfowl Days by guild for each of 5 Wolfe Island survey sectors**

	C7	C8	C9	C10	C11	Total
Swans	3,856	3,973	8,664	11,198	2,648	**30,338**
Geese	86,328	7,489	42,433	161,464	94,146	**391,859**
Large dabblers	32,211	58,932	102,652	60,698	86,314	**340,805**
Small dabblers	92	0	24,555	188	1,154	**25,988**
Bay ducks	208,707	173,084	937,169	117,987	22,751	**1,459,697**
Sea ducks	6,496	0	121	11	36	**6,664**
Goldeneye	16,075	11,973	5,329	7,312	28,876	**69,564**
Mergansers	8,394	12,630	3,482	2,953	8,594	**36,052**
Total	**362,157**	**268,080**	**1,124,403**	**361,809**	**244,517**	**2,360,965**

FALL 2008: Waterfowl Days by guild for each of 5 Wolfe Island survey sectors

	C7	C8	C9	C10	C11	Total
Swans	3,880	2,811	7,712	5,149	1,409	**20,960**
Geese	57,908	13,909	70,155	204,340	44,558	**390,868**
Large dabblers	24,206	54,148	89,837	92,804	93,449	**354,443**
Small dabblers	18	3,508	123,614	4,090	1,532	**132,761**
Bay ducks	88,611	44,682	663,450	305,338	37,154	**1,139,233**
Sea ducks	0	45	0	0	40	**85**
Goldeneye	39,137	9,929	5,815	24,662	58,410	**137,951**
Mergansers	4,734	9,251	11,907	24,841	7,670	**58,403**
Total	**218,493**	**138,282**	**972,487**	**661,222**	**244,219**	**2,234,702**

FALL 1999: Waterfowl Days by guild for each of 5 Wolfe Island survey sectors

	C7	C8	C9	C10	C11	Total
Swans	0	29	60	4,326	5,070	**9,484**
Geese	32,257	11,086	178,610	123,667	151,176	**496,794**
Large dabblers	65,807	90,719	275,893	131,518	198,621	**762,557**
Small dabblers	615	80	46,115	0	380	**47,190**
Bay ducks	46,486	2,648	997,650	104,538	1,755	**1,153,076**
Sea ducks	304	0	0	0	29	**333**
Goldeneye	7,117	6,652	6,444	16,408	38,975	**75,595**
Mergansers	10,365	10,459	11,360	4,818	6,664	**43,665**
Total	**162,950**	**121,671**	**1,516,131**	**385,273**	**402,668**	**2,588,692**

Aerial Waterfowl Survey Results by Major Staging Area

FALL 2011: Waterfowl Days by guild for major staging areas on Wolfe Island

	Bayfield	Button	Pyke's	Reed's	Total
Swans	7,520	2,692	438	858	11,508
Geese	39,705	50,254	20,817	15,313	126,089
Large dabblers	57,127	23,452	13,376	17,366	111,321
Small dabblers	7,253	26	0	0	7,279
Bay ducks	601,225	108,028	0	3,480	712,733
Sea ducks	0	0	0	0	0
Goldeneye	2,351	3,965	7,302	12,605	26,223
Mergansers	6,143	668	624	2,335	9,770
Total	**721,322**	**189,083**	**42,555**	**51,956**	**1,004,916**

FALL 2010: Waterfowl Days by guild for major staging areas on Wolfe Island

	Bayfield	Button	Pyke's	Reed's	Total
Swans	2,972	6,036	364	165	9,536
Geese	2,908	26,538	70,695	22,837	122,977
Large dabblers	104,985	14,943	17,550	14,323	151,800
Small dabblers	23,723	800	0	0	24,523
Bay ducks	332,765	234,678	0	0	567,443
Sea ducks	546	0	0	13	559
Goldeneye	3,953	11,052	7,020	14,834	36,859
Mergansers	781	2725	747	8746	13,004
Total	**472,637**	**296,770**	**96,376**	**60,918**	**926,700**

FALL 2009: Waterfowl Days by guild for major staging areas on Wolfe Island

	Bayfield	Button	Pyke's	Reed's	Total
Swans	6,390	5,658	0	316	**12,363**
Geese	10,961	22,743	95,084	75,954	**204,741**
Large dabblers	28,347	18,639	28,341	29,719	**105,046**
Small dabblers	24,437	0	0	56	**24,493**
Bay ducks	880,773	114,136	230	1,623	**996,762**
Sea ducks	55	0	11	36	**102**
Goldeneye	1,402	1,752	1,144	6,001	**10,299**
Mergansers	2,067	191	1,219	3,955	**7,432**
Total	**954,431**	**163,118**	**126,029**	**117,659**	**1,361,236**

FALL 2008: Waterfowl Days by guild for major staging areas on Wolfe Island

	Bayfield	Button	Pyke's	Reed's	Total
Swans	6,293	2,525	0	359	**9,177**
Geese	5,944	44,745	83,388	16,586	**150,662**
Large dabblers	10,127	28,221	32,855	31,650	**102,853**
Small dabblers	112,209	3,555	400	0	**116,164**
Bay ducks	512,438	301,888	0	0	**814,325**
Sea ducks	0	0	0	40	**40**
Goldeneye	4,325	9,515	1,518	14,019	**29,377**
Mergansers	3,745	22,612	141	608	**27,105**
Total	**655,080**	**413,060**	**118,302**	**63,261**	**1,249,702**

Appendix G

Notifications

Taylor, Andrew

From: Garry Perfect <Garry_Perfect@transalta.com>
Sent: Wednesday, July 06, 2011 11:14 AM
To: Prevost, Eric (MNR); Read,Rob [Burlington]; rob.dobos@ec.gc.ca; Leblanc, Mathieu
Cc: Taylor, Andrew
Subject: Wolfe Island Wind Plant Notification #1

Good morning all:

This email provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant during the period May 23 – July 1, 2011.

High Annual Mortality Rates - Raptors

The Post-Construction Follow-Up Plan for Bird and Bat Resources at the Wolfe Island Wind Plant states that NRCan, EC, and MNR will be notified if two raptor fatalities are noted over a six-week period.

A Rough-legged Hawk carcass was discovered at turbine 59 on May 23 during the on-going mortality searches. Then, on July 1, a Red-tailed Hawk was found at turbine 32.

Please feel free to contact me directly should you wish to discuss this notification.

Garry Perfect
Environmental Specialist

Ph:519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745
34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

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Taylor, Andrew

From: Garry Perfect <Garry_Perfect@transalta.com>
Sent: Wednesday, July 20, 2011 2:11 PM
To: Prevost, Eric (MNR); Read,Rob [Burlington]; rob.dobos@ec.gc.ca; Leblanc, Mathieu
Cc: 'liz.sauer@ec.gc.ca'; 'mary.vincent@ec.gc.ca'; 'madeline.austen@ec.gc.ca'; Taylor, Andrew
Subject: Wolfe Island Wind Plant Notification #2

Good afternoon all:
This email provides the details of two notification thresholds that have been met at the Wolfe Island Wind Plant.

Mortality of Species at Risk

As stated in the Post-Construction Follow-Up Plan for the Wolfe Island Wind Plant, NRCan, EC, and MNR will be notified if mortality of a species at risk is observed.

On July 13, 2011 a single Bobolink fatality was recorded at turbine 14 during the on-going mortality searches. A second Bobolink fatality was recorded at turbine 79 on July 20, 2011. Both fatalities were either female or juvenile; an attempt to confirm the age of each specimen will be made in the near future. This species is listed as Threatened on the Species at Risk in Ontario List of the provincial *Endangered Species Act* (2007). Bobolink has also been evaluated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but is currently not on a Schedule of the federal *Species at Risk Act.*

Please contact me directly should you wish to discuss this notification.

Garry Perfect
Environmental Specialist

Ph:519-826-4645 x225 Cell:519-820-8204 Fax:519-826-4745
34 Harvard Road, Guelph, Ontario, N1G 4V8
Garry_Perfect@transalta.com

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Taylor, Andrew

From: Taylor, Andrew
Sent: Monday, August 08, 2011 12:27 PM
To: Prevost, Eric (MNR); Read,Rob [Burlington]; rob.dobos@ec.gc.ca; Leblanc, Mathieu
Cc: 'liz.sauer@ec.gc.ca'; 'mary.vincent@ec.gc.ca'; 'madeline.austen@ec.gc.ca'; 'Garry Perfect'
Subject: Wolfe Island Wind Plant Notification #3

Good afternoon all:
On behave of Garry Perfect, this emails provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant.

Mortality of Species at Risk

As stated in the Post-Construction Follow-Up Plan for the Wolfe Island Wind Plant, NRCan, EC, and MNR will be notified if mortality of a species at risk is observed.

On July 29, 2011 a single Bobolink fatality was recorded at turbine 15. The fatalities was either female or juvenile; an attempt to confirm the age of the specimen will be made in the near future. This species is listed as Threatened on the Species at Risk in Ontario List of the provincial *Endangered Species Act*. Bobolink has also been evaluated as Threatened by COSEWIC but is currently not on a Schedule of the federal *Species at Risk Act*.

Please feel free to contact myself or Garry Perfect should you wish to discuss this notification.

Andrew Taylor
Terrestrial Ecologist
Stantec
Suite 1 - 70 Southgate Drive
Guelph ON N1G 4P5
Ph: (519) 836-6050 Ext. 222
Fx: (519) 836-2493
andrew.taylor@stantec.com
stantec.com

Taylor, Andrew

From: Garry Perfect <Garry_Perfect@transalta.com>
Sent: Wednesday, August 31, 2011 8:37 AM
To: Prevost, Eric (MNR); Read,Rob [Burlington]; rob.dobos@ec.gc.ca; Leblanc, Mathieu
Cc: liz.sauer@ec.gc.ca; mary.vincent@ec.gc.ca; madeline.austen@ec.gc.ca; Taylor, Andrew
Subject: Wolfe Island Wind Plant Notification #4

Good morning all:

The following provides the details of one notification threshold that has been met at the Wolfe Island Wind Plant

Mortality of Species at Risk

As stated in the Post-Construction Follow-Up Plan for the Wolfe Island Wind Plant, NRCan, EC, and MNR will be notified if mortality of a species at risk is observed.

On August 22, 2011 a single Bobolink fatality was recorded at turbine 33 during the on-going mortality searches. The fatality was either female or juvenile; an attempt to confirm the age of the specimen will be made in the near future. This species is listed as Threatened on the Species at Risk in Ontario List of the provincial *Endangered Species Act* (2007). Bobolink has also been evaluated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but is currently not on a Schedule of the federal *Species at Risk Act.*

Please contact me directly should you wish to discuss this notification.

Regards,

Garry Perfect
Environmental Specialist

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