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BLUEWATER WIND ENERGY CENTRE

Avian Use Monitoring Report - 2010

Submitted to:

Thomas Bird
Environmental Services Project Manager
NextEra Energy Canada, ULC
5500 North Service Road,
Burlington, ON L7L 6W6

REPORT



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1.0 INTRODUCTION

During 2010, Golder Associates Ltd. (Golder) was retained by NextEra Energy Canada (NextEra) to undertake a bird monitoring program for a proposed wind power project near Grand Bend, Ontario (Figure 1), called the Bluewater Wind Energy Centre (the Project). The purpose of this field program was to collect data on bird use in the Avian Study Area during the winter, spring, summer, and fall of 2010. This field program was implemented to supplement the Natural Heritage Assessment Report (NHA) of a Renewable Energy Approval (REA) submission. Surveys were initiated prior to final determination of project layout, but survey plots were selected to sample the overall Avian Study Area from a landscape perspective. As a result, a protocol for collecting these data was developed to meet the expectations of Environment Canada (EC) and the Ontario Ministry of Natural Resources (OMNR), based on previous discussions with these agencies and a review of guidelines and draft guidelines (e.g., Kingsley and Whittam 2007; OMNR 2010). Specifically, Golder undertook avian use surveys (AUS) to assess the distribution, abundance, and flight behaviour of the avifauna in the Avian Study Area.

1.1 Background

Observed effects of wind energy projects on birds are either direct, as in the case of mortality arising from collisions with wind turbines, or indirect, as in the case of habitat loss for infrastructure or disturbance of habitat through changes in existing activity levels or sensory disturbance. In fact, indirect effects may have a greater impact than direct mortality. In general, public perception tends to considerably inflate the avian mortality attributable to wind energy projects (EC 2007). The actual avian mortality depends on a number of site-specific factors, including bird densities and the types of species and habitats present, as well as the wind farm design features that may either individually, or in combination with each other, influence avian mortality. The scope of the study described herein did not account for these details, or specific habitats within 120 m of the project facilities, since they were not known at the time these studies were conducted and will be further outlined within the NHA. These unknown factors include:

- Topography;
- Scale of the facility;
- Tower dimension and design;
- Turbine lighting;
- Blade speed;
- Adjacent habitat type;
- Transmission line design and location; and
- Facility configuration.

A large number of studies have been undertaken to investigate concerns related to avian mortality resulting from wind farms (e.g., Osborn *et al.*, 2000; Johnson *et al.*, 2003; Barrios and Rodríguez 2004; Echotrack 2005; Drewitt and Langston 2006). These findings indicate that overall, bird deaths due to wind turbines are low, especially when compared to other anthropogenic structures. In one particular study of avian mortality (Erickson



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et al., 2005), an extensive literature review was conducted and a comparison of annual avian mortality in the U.S. was presented. This same study indicated that the annual average number of birds killed in the USA is estimated at 2.19 birds per turbine per year.

Table 1: Predicted Annual Avian Mortality Rates, USA (from Erickson *et al.* 2005)

Anthropogenic Structure	Bird Deaths/Year
Vehicles	80,000,000
Buildings and Windows	550,000,000
Cats	100,000,000
Power Lines	130,000,000
Communication Towers	4,500,000
Wind Power Parks	28,500

Although avian mortality due to wind turbines is reported to be low in comparison to other anthropogenic structures, when selecting and assessing infrastructure layouts during the environmental screening process, it is important to identify bird breeding, staging, and foraging areas, as well as migration routes, to minimize potentially adverse environmental effects.

This technical report documents richness, abundance and flight characteristics of the avian community of the Avian Study Area to assess any potentially adverse environmental effects of the proposed Project on birds. We consider the field program to be appropriate for examining the dynamics of bird movements for the Avian Study Area. The surveys provide a representative cross-section of the diversity, abundance, and behaviour of birds using the Avian Study Area.



2.0 METHODS

2.1 Literature Review

A variety of documents and information sources were reviewed to develop the monitoring protocol, determine important bird-related issues, and to identify site-specific records of natural features, habitats, or species occurrences that were relevant to the proposed Project. Guidance regarding monitoring protocols and report contents was obtained from the following sources:

- Birds and Bird Habitats: Guidelines for Wind Power Projects. (OMNR, October 2010);
- Kingsley, A. and B. Whittam. 2007. Wind Turbines and Birds: A Background Review for Environmental Assessment. Prepared for the Canadian Wildlife Service. Draft April 2, 2007;
- Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Prepared by the Canadian Wildlife Service. Final Report, February 2007; and
- Wind Turbines and Birds: A Guidance Document for Environmental Assessment. Final Report (EC, April 2007).

Technical information regarding breeding, resident, wintering and migrant birds, national, provincial, and regional bird status, and species of conservation concern were collected from the following sources:

- Bird Studies Canada. Conservation Priorities for the Birds of Southern Ontario (Couturier 1999);
- Canada *Species at Risk Act* (Species at Risk Act 2002);
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010);
- Natural Heritage Information Centre (NHIC) database (www.mnr.gov.on.ca/MNR/nhic/nhic.cfm);
- Ontario *Endangered Species Act* (Endangered Species Act 2007); and
- Ontario Partners in Flight. Ontario Landbird Conservation Plan. (Ontario Partners in Flight 2008).

2.2 Avian Use Surveys

Avian use surveys were conducted in winter, spring, summer, and fall of 2010 (Table 2). These were supplemented with area searches while in the Avian Study Area. The majority of surveys were roadside counts to allow for greater coverage of the Avian Study Area. However, some off-road counts were conducted in woodlot areas and along the shore of Lake Huron, where access was available. Bird surveys began at, or within, one-half hour of sunrise, depending upon the season, and continued throughout the day. Surveys were only conducted when weather conditions with respect to precipitation and wind were within the parameters required by monitoring programs such as the Breeding Bird Survey (Droege 1990), the Ontario Forest Bird Monitoring Program (Welsh 1995), or Long Point Bird Observatory's Migration Monitoring Protocol (Bird Studies Canada 2010). Although wind conditions were often suitable during the early mornings, wind speeds typically increased through the morning. As a result of increased wind speeds, the ability to detect birds by calls or sounds was often diminished. Given the location of the Avian Study Area and nature of the proposed undertaking, this was not surprising. To accommodate these conditions, the order of sampling plots was



changed with successive visits, where possible, so that each plot received visits in the earlier part of the morning and/or in low wind conditions, over a given survey period.

A total of twenty five (25) AUS plots were established to provide adequate landscape coverage throughout the Avian Study Area (Figure 2). AUS counts were ten minutes in duration and all species heard or observed within an unlimited radius were recorded. Information recorded for each observation included the number of birds in the flock (if the observation was of a flock), species, behaviour (either perched, soaring, in flight, or flying in a specific direction), relative flight height and flight direction, and distance to individuals or flocks.

Table 2: Survey Types and Dates

Survey	Date
Winter Bird Survey 1	22 January 2010
Winter Bird Survey 2	18 February 2010
Spring Tundra Swan/Waterfowl Survey	18 March 2010
Spring Migration Survey 1	08 April 2010
Spring Migration Survey 2	03 May 2010
Spring Migration Survey 3	16 May 2010
Breeding Bird Survey 1	07 June 2010
Breeding Bird Survey 2	30 June 2010
Fall Migration Survey 1	28 August 2010
Fall Migration Survey 2	13 September 2010
Fall Migration Survey 3	30 September 2010
Fall Migration Survey 4	09 November 2010

2.3 Spring Tundra Swan/Waterfowl Surveys

In addition to standard Avian Use Surveys, a separate survey was conducted during the late fall and early spring in the Avian Study Area to survey for migrating tundra swans and other waterfowl. All roads within the study area were driven, with frequent stops made to survey fields and other habitats for birds. In addition, the shore of Lake Huron, on the westernmost edge of the Avian Study Area was surveyed. Fields and Lake Huron were scanned using a high power spotting scope and good quality binoculars. All birds identified were recorded.



3.0 RESULTS

When all data were compiled from all surveys conducted in the winter, spring, summer and fall, calculations were made of the total number of individuals observed (which may include repeat observations of one individual on multiple visits), and the proportion that species comprised of the total bird observations from that season (Table 3).

Table 3: Number of Individuals and Percent Composition of Bird Species Recorded in the Avian Study Area during Avian Use Surveys, 2010

Common Name	Scientific Name	Winter		Spring		Summer		Fall		Total
		Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	
American crow	Corvus brachyrhynchos	144	21.65%	56	1.93%	56	2.93%	366	6.42%	622
American goldfinch	Carduelis tristis	12	1.80%	27	0.93%	58	3.04%	188	3.30%	285
American kestrel	Falco sparverius	1	0.15%	4	0.14%	1	0.05%	2	0.04%	8
American pipit	Anthus rubescens	0	0.00%	0	0.00%	0	0.00%	72	1.26%	72
American redstart	Setophaga ruticilla	0	0.00%	3	0.10%	5	0.26%	2	0.04%	10
American robin	Turdus migratorius	0	0.00%	185	6.39%	95	4.98%	115	2.02%	395
American tree sparrow	Spizella arborea	0	0.00%	0	0.00%	0	0.00%	5	0.09%	5
bald eagle	Haliaeetus leucocephalus	2	0.30%	0	0.00%	0	0.00%	3	0.05%	5
Baltimore oriole	Icterus galbula	0	0.00%	16	0.55%	18	0.94%	3	0.05%	37
bank swallow	Riparia riparia	0	0.00%	0	0.00%	57	2.99%	0	0.00%	57
barn swallow	Hirundo rustica	0	0.00%	49	1.69%	90	4.71%	261	4.58%	400
bay-breasted warbler	Dendroica castanea	0	0.00%	2	0.07%	0	0.00%	0	0.00%	2
belted kingfisher	Ceryle alcyon	0	0.00%	2	0.07%	1	0.05%	0	0.00%	3
black-and-white warbler	Mniotilta varia	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
black-bellied plover	Pluvialis squatarola	0	0.00%	2	0.07%	0	0.00%	0	0.00%	2
blackburnian warbler	Dendroica fusca	0	0.00%	2	0.07%	3	0.10%	0	0.00%	2
black-capped chickadee	Poecile atricapilla	22	3.31%	11	0.38%	9	0.47%	47	0.82%	89
black-throated green warbler	Dendroica virens	0	0.00%	2	0.07%	0	0.00%	1	0.02%	3
blue jay	Cyanocitta cristata	6	0.90%	199	6.87%	11	0.58%	138	2.42%	354
blue-gray gnatcatcher	Poliopitila caerulea	0	0.00%	1	0.03%	3	0.10%	1	0.02%	2
blue-headed vireo	Vireo solitarius	0	0.00%	0	0.00%	0	0.00%	4	0.07%	4
Bobolink	Dolichonyx oryzivorus	0	0.00%	27	0.93%	13	0.68%	21	0.37%	61
Bohemian waxwing	Bombycilla garrulus	0	0.00%	0	0.00%	0	0.00%	35	0.61%	35
brown creeper	Certhia americana	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
brown thrasher	Toxostoma rufum	0	0.00%	7	0.24%	8	0.42%	2	0.04%	17
brown-headed cowbird	Molothrus ater	0	0.00%	76	2.62%	46	2.41%	50	0.88%	172
Canada goose	Branta canadensis	0	0.00%	77	2.66%	9	0.47%	459	8.05%	545
Cape May warbler	Dendroica tigrina	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
cedar waxwing	Bombycilla cedrorum	0	0.00%	0	0.00%	18	0.94%	28	0.49%	46
chimney swift	Chaetura pelagica	0	0.00%	0	0.00%	2	0.10%	1	0.02%	3
chipping sparrow	Spizella passerina	0	0.00%	12	0.41%	30	1.57%	23	0.40%	65
cliff swallow	Petrochelidon pyrrhonota	0	0.00%	0	0.00%	9	0.47%	161	2.82%	170



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Common Name	Scientific Name	Winter		Spring		Summer		Fall		Total
		Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	
common grackle	Quiscalus quiscula	0	0.00%	191	6.59%	165	8.64%	28	0.49%	384
common loon	Gavia immer	0	0.00%	6	0.21%	0	0.00%	3	0.05%	9
common redpoll	Carduelis flammea	4	0.60%	0	0.00%	0	0.00%	0	0.00%	4
common yellowthroat	Geothlypis trichas	0	0.00%	6	0.21%	13	0.68%	6	0.11%	25
cooper's hawk	Accipiter cooperii	0	0.00%	2	0.07%	0	0.00%	1	0.02%	3
dark-eyed junco	Junco hyemalis	11	1.65%	12	0.41%	0	0.00%	26	0.46%	49
double-crested cormorant	Phalacrocorax auritus	0	0.00%	5	0.17%	0	0.00%	0	0.00%	5
downy woodpecker	Picoides pubescens	0	0.00%	2	0.07%	1	0.05%	10	0.18%	13
eastern bluebird	Sialia sialis	0	0.00%	6	0.21%	0	0.00%	0	0.00%	6
eastern kingbird	Tyrannus tyrannus	0	0.00%	6	0.21%	4	0.21%	4	0.07%	14
eastern meadowlark	Sturnella magna	0	0.00%	1	0.03%	1	0.05%	0	0.00%	2
eastern phoebe	Sayornis phoebe	0	0.00%	10	0.35%	4	0.21%	2	0.04%	16
eastern wood-pewee	Contopus virens	0	0.00%	4	0.14%	3	0.16%	3	0.05%	10
European starling	Sturnus vulgaris	157	23.61%	205	7.08%	239	12.52%	1121	19.65%	1722
field sparrow	Spizella pusilla	0	0.00%	1	0.03%	2	0.10%	0	0.00%	3
golden-crowned kinglet	Regulus satrapa	0	0.00%	8	0.28%	0	0.00%	5	0.09%	13
great blue heron	Ardea herodias	0	0.00%	2	0.07%	0	0.00%	5	0.09%	7
great crested flycatcher	Myiarchus crinitus	0	0.00%	4	0.14%	12	0.63%	2	0.04%	18
great horned owl	Bubo virginianus	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
grey catbird	Dumetella carolinensis	0	0.00%	4	0.14%	13	0.68%	17	0.30%	34
gull species	Laridae	2	0.30%	0	0.00%	0	0.00%	0	0.00%	2
hairy woodpecker	Picoides villosus	2	0.30%	0	0.00%	1	0.05%	2	0.04%	5
hermit thrush	Catharus guttatus	0	0.00%	0	0.00%	0	0.00%	2	0.04%	2
herring gull	Larus argentatus	1	0.15%	7	0.24%	0	0.00%	1	0.02%	9
horned lark	Eremophila alpestris	124	18.65%	78	2.69%	65	3.40%	96	1.68%	363
house finch	Carpodacus mexicanus	0	0.00%	3	0.10%	4	0.21%	2	0.04%	9
house sparrow	Passer domesticus	9	1.35%	28	0.97%	85	4.45%	99	1.74%	221
house wren	Troglodytes aedon	0	0.00%	6	0.21%	20	1.05%	2	0.04%	28
indigo bunting	Passerina cyanea	0	0.00%	3	0.10%	22	1.15%	1	0.02%	26
Killdeer	Charadrius vociferus	0	0.00%	61	2.11%	45	2.36%	46	0.81%	152
Lapland longspur	Calcarius lapponicus	0	0.00%	10	0.35%	0	0.00%	0	0.00%	10
least flycatcher	Empidonax minimus	0	0.00%	4	0.14%	1	0.05%	0	0.00%	5
Lincoln's sparrow	Melospiza lincolni	0	0.00%	0	0.00%	0	0.00%	5	0.09%	5
magnolia warbler	Dendroica magnolia	0	0.00%	0	0.00%	0	0.00%	3	0.05%	3
Mallard	Anas platyrhynchos	0	0.00%	28	0.97%	7	0.37%	18	0.32%	53
mourning dove	Zenaida macroura	1	0.15%	22	0.76%	44	2.30%	74	1.30%	141



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Common Name	Scientific Name	Winter		Spring		Summer		Fall		Total
		Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	
mourning warbler	Oporornis philadelphia	0	0.00%	0	0.00%	1	0.05%	0	0.00%	1
Nashville warbler	Vermivora ruficapilla	0	0.00%	3	0.10%	0	0.00%	8	0.14%	11
northern cardinal	Cardinalis cardinalis	2	0.30%	9	0.31%	4	0.21%	4	0.07%	19
northern flicker	Colaptes auratus	0	0.00%	28	0.97%	4	0.21%	12	0.21%	44
northern harrier	Circus cyaneus	0	0.00%	1	0.03%	1	0.05%	0	0.00%	2
northern rough-winged swallow	Stelgidopteryx serripennis	0	0.00%	0	0.00%	1	0.05%	35	0.61%	36
northern waterthrush	Seiurus noveboracensis	0	0.00%	1	0.03%	0	0.00%	0	0.00%	1
orange-crowned warbler	Vermivora celata	0	0.00%	0	0.00%	0	0.00%	2	0.04%	2
Ovenbird	Seiurus aurocapilla	0	0.00%	2	0.07%	2	0.10%	2	0.04%	6
palm warbler	Dendroica palmarum	0	0.00%	0	0.00%	0	0.00%	11	0.19%	11
Philadelphia vireo	Vireo philadelphicus	0	0.00%	1	0.03%	0	0.00%	1	0.02%	2
pileated woodpecker	Dryocopus pileatus	0	0.00%	1	0.03%	0	0.00%	2	0.04%	3
purple martin	Progne subis	0	0.00%	0	0.00%	1	0.05%	1	0.02%	2
red-bellied woodpecker	Melanerpes carolinus	0	0.00%	3	0.10%	3	0.16%	4	0.07%	10
red-breasted nuthatch	Sitta canadensis	1	0.15%	0	0.00%	0	0.00%	4	0.07%	5
red-eyed vireo	Vireo olivaceus	0	0.00%	10	0.35%	17	0.89%	2	0.04%	29
red-tailed hawk	Buteo jamaicensis	8	1.20%	1	0.03%	10	0.52%	18	0.32%	37
red-winged blackbird	Agelaius phoeniceus	0	0.00%	227	7.84%	171	8.96%	96	1.68%	494
ring-billed gull	Larus delawarensis	0	0.00%	809	27.93%	34	1.78%	482	8.45%	1325
rock pigeon	Columba livia	33	4.96%	38	1.31%	18	0.94%	94	1.65%	183
rose-breasted grosbeak	Pheucticus ludovicianus	0	0.00%	6	0.21%	20	1.05%	3	0.05%	29
rough-legged hawk	Buteo lagopus	8	1.20%	0	0.00%	0	0.00%	2	0.04%	10
ruby-crowned kinglet	Regulus calendula	0	0.00%	0	0.00%	0	0.00%	13	0.23%	13
ruby-throated hummingbird	Archilochus colubris	0	0.00%	0	0.00%	0	0.00%	8	0.14%	8
rusty blackbird	Euphagus carolinus	0	0.00%	5	0.17%	0	0.00%	7	0.12%	12
sandhill crane	Grus canadensis	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
savannah sparrow	Passerculus sandwichensis	0	0.00%	58	2.00%	46	2.41%	24	0.42%	128
scarlet tanager	Piranga olivacea	0	0.00%	0	0.00%	4	0.21%	1	0.02%	5
sharp-shinned hawk	Accipiter striatus	0	0.00%	0	0.00%	0	0.00%	9	0.16%	9
snow bunting	Plectrophenax nivalis	104	15.64%	0	0.00%	0	0.00%	50	0.88%	154
song sparrow	Melospiza melodia	0	0.00%	66	2.28%	62	3.25%	79	1.38%	207
spotted sandpiper	Actitis macularia	0	0.00%	0	0.00%	2	0.10%	0	0.00%	2
Swainson's thrush	Catharus ustulatus	0	0.00%	0	0.00%	0	0.00%	7	0.12%	7
swamp sparrow	Melospiza georgiana	0	0.00%	0	0.00%	0	0.00%	11	0.19%	11
Tennessee warbler	Vermivora peregrina	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
tree swallow	Tachycineta bicolor	0	0.00%	19	0.66%	11	0.58%	613	10.75%	643



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Common Name	Scientific Name	Winter		Spring		Summer		Fall		Total
		Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	
turkey vulture	Cathartes aura	0	0.00%	61	2.11%	127	6.65%	344	6.03%	532
upland sandpiper	Bartramia longicauda	0	0.00%	1	0.03%	1	0.05%	0	0.00%	2
Veery	Catharus fuscescens	0	0.00%	1	0.03%	0	0.00%	0	0.00%	1
vesper sparrow	Poocetes gramineus	0	0.00%	18	0.62%	25	1.31%	5	0.09%	48
warbling vireo	Vireo gilvus	0	0.00%	9	0.31%	20	1.05%	4	0.07%	33
white-breasted nuthatch	Sitta carolinensis	1	0.15%	3	0.10%	0	0.00%	5	0.09%	9
white-crowned sparrow	Zonotrichia leucophrys	0	0.00%	0	0.00%	0	0.00%	9	0.16%	9
white-throated sparrow	Zonotrichia albicollis	0	0.00%	7	0.24%	0	0.00%	123	2.16%	130
wild turkey	Meleagris gallopava	10	1.50%	1	0.03%	0	0.00%	0	0.00%	11
willow flycatcher	Empidonax traillii	0	0.00%	0	0.00%	1	0.05%	0	0.00%	1
Wilson's warbler	Wilsonia pusilla	0	0.00%	0	0.00%	0	0.00%	2	0.04%	2
winter wren	Troglodytes troglodytes	0	0.00%	0	0.00%	0	0.00%	1	0.02%	1
wood duck	Aix sponsa	0	0.00%	2	0.07%	0	0.00%	0	0.00%	2
wood thrush	Hylocichla mustelina	0	0.00%	6	0.21%	18	0.94%	0	0.00%	24
yellow warbler	Dendroica petechia	0	0.00%	10	0.35%	12	0.63%	0	0.00%	22
yellow-bellied flycatcher	Empidonax flaviventris	0	0.00%	3	0.10%	0	0.00%	0	0.00%	3
yellow-bellied sapsucker	Sphyrapicus varius	0	0.00%	1	0.03%	3	0.16%	0	0.00%	4
yellow-rumped warbler	Dendroica coronata	0	0.00%	0	0.00%	0	0.00%	28	0.49%	28
yellow-throated vireo	Vireo flavifrons	0	0.00%	1	0.03%	3	0.16%	0	0.00%	4
Total		665	100.00%	2897	100.00%	1909	100.00%	5704	100.00%	11175

Due to potential differences in risk of collision with turbines of different bird groups (Kingsley and Whittam 2007), data are summarized according to seven bird groups: gamebirds (including turkeys, partridges and grouse); waterfowl (including ducks, geese and swans); waterbirds (including gulls, herons, rails, and cormorants); shorebirds (including plovers and sandpipers); raptors (including hawks, falcons, eagles and, for the purposes of this summary, vultures); passerines (including songbirds and near passerine landbirds); and woodpeckers (Table 4).

Table 4: Number of Individuals and Percent Composition of Bird Groups in the Avian Study Area during Avian Use Surveys, 2010

Bird Group	Winter		Spring		Breeding		Fall		Total	
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition
Gamebirds	10	1.50%	1	0.03%	0	0.00%	0	0.00%	11	0.10%
Passerines	631	94.89%	1792	61.86%	1660	86.96%	4279	75.02%	8362	74.83%
Raptors	19	2.86%	69	2.38%	139	7.28%	380	6.66%	607	5.43%
Shorebirds	0	0.00%	64	2.21%	48	2.51%	46	0.81%	158	1.41%



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Bird Group	Winter		Spring		Breeding		Fall		Total	
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition
Waterbirds	3	0.45%	829	28.62%	34	1.78%	492	8.62%	1358	12.15%
Waterfowl	0	0.00%	107	3.69%	16	0.84%	477	8.36%	600	5.37%
Woodpeckers	2	0.30%	35	1.21%	12	0.63%	30	0.53%	79	0.71%
Total	665	100.00%	2897	100.00%	1909	100.00%	5704	100.00%	11175	100.00%

For each group of species, observations included approximate flight heights (Table 5).

Table 5: Average Flight Height of Bird Groups during Avian Use Surveys by Season

Bird Group	Average Flight Height (m)				
	Winter	Spring	Breeding	Fall	Total Average
Gamebirds	none observed	none observed	none observed	none observed	nil
Passerines	23.19	16.30	15.25	17.22	17.99
Raptors	25.48	73.14	82.88	74.79	64.07
Shorebirds	none observed	17.04	18.30	21.42	18.92
Waterbirds	35.00	35.15	42.22	54.87	41.81
Waterfowl	none observed	19.76	12.50	48.03	26.76
Woodpeckers	6.67	7.33	18.75	22.74	13.87
Total Average	22.58	28.12	31.65	39.85	30.57

Birds observed within 30 m of the ground were considered to be below the sweep of the rotor blades, those flying from 30 to 130 m were considered to be within the sweep of the rotor blades, and those birds observed flying above 130 m were considered to be above the rotor sweep (Tables 6 and 7).

Table 6: Number of Individuals and Percent Composition of Bird Groups Observed Flying During Avian Use Surveys (All Seasons Combined)

Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	
Gamebirds	10	0.12%	0	0.00%	0	0.00%	0	0.00%	10
Passerines	5006	60.92%	1099	13.37%	32	0.39%	191	2.32%	6328
Raptors	32	0.39%	537	6.53%	7	0.09%	6	0.07%	582
Shorebirds	74	0.90%	11	0.13%	1	0.01%	3	0.04%	89
Waterbirds	157	1.91%	449	5.46%	14	0.17%	4	0.05%	624
Waterfowl	344	4.19%	206	2.51%	0	0.00%	10	0.12%	560
Woodpeckers	21	0.26%	3	0.04%	0	0.00%	1	0.01%	25
Total	5644	68.69%	2305	28.05%	54	0.66%	215	2.62%	8218



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Table 7: Number of Individuals and Percent Composition of All Birds Observed Flying During Avian Use Surveys (All Seasons Combined).

Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
American crow	399	3.57%	79	0.71%	1	0.01%	7	0.06%	486
American goldfinch	217	1.94%	18	0.16%	0	0.00%	28	0.25%	263
American kestrel	1	0.01%	0	0.00%	0	0.00%	1	0.01%	2
American pipit	49	0.44%	10	0.09%	0	0.00%	8	0.07%	67
American redstart	0	0.00%	0	0.00%	1	0.01%	0	0.00%	1
American robin	164	1.47%	37	0.33%	7	0.06%	2	0.02%	210
American tree sparrow	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
bald eagle	1	0.01%	2	0.02%	0	0.00%	0	0.00%	3
Baltimore oriole	16	0.14%	1	0.01%	0	0.00%	0	0.00%	17
bank swallow	49	0.44%	8	0.07%	0	0.00%	0	0.00%	57
barn swallow	350	3.13%	45	0.40%	0	0.00%	5	0.04%	400
bay-breasted warbler	0	0.00%	0	0.00%	0	0.00%	2	0.02%	2
belted kingfisher	1	0.01%	1	0.01%	0	0.00%	1	0.01%	3
black-and-white warbler	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
black-bellied plover	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
blackburnian warbler	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
black-capped chickadee	27	0.24%	1	0.01%	1	0.01%	0	0.00%	29
black-throated green warbler	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
blue jay	124	1.11%	196	1.75%	2	0.02%	2	0.02%	324
blue-gray gnatcatcher	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
blue-headed vireo	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
bobolink	27	0.24%	26	0.23%	0	0.00%	2	0.02%	55



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Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
bohemian waxwing	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
brown creeper	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
brown thrasher	5	0.04%	1	0.01%	1	0.01%	0	0.00%	7
brown-headed cowbird	135	1.21%	14	0.13%	0	0.00%	0	0.00%	149
Canada goose	310	2.77%	205	1.83%	0	0.00%	9	0.08%	524
Cape May warbler	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
cedar waxwing	32	0.29%	2	0.02%	0	0.00%	5	0.04%	39
chimney swift	0	0.00%	3	0.03%	0	0.00%	0	0.00%	3
chipping sparrow	32	0.29%	0	0.00%	0	0.00%	0	0.00%	32
cliff swallow	166	1.49%	4	0.04%	0	0.00%	0	0.00%	170
common grackle	237	2.12%	73	0.65%	1	0.01%	4	0.04%	315
common loon	0	0.00%	0	0.00%	9	0.08%	0	0.00%	9
common redpoll	0	0.00%	0	0.00%	0	0.00%	4	0.04%	4
common yellowthroat	3	0.03%	0	0.00%	0	0.00%	0	0.00%	3
cooper's hawk	1	0.01%	2	0.02%	0	0.00%	0	0.00%	3
dark-eyed junco	41	0.37%	0	0.00%	0	0.00%	0	0.00%	41
double-crested cormorant	0	0.00%	0	0.00%	5	0.04%	0	0.00%	5
downy woodpecker	5	0.04%	0	0.00%	0	0.00%	0	0.00%	5
eastern bluebird	6	0.05%	0	0.00%	0	0.00%	0	0.00%	6
eastern kingbird	10	0.09%	0	0.00%	0	0.00%	0	0.00%	10
eastern meadowlark	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
eastern phoebe	6	0.05%	0	0.00%	0	0.00%	1	0.01%	7
eastern wood-pewee	0	0.00%	1	0.01%	3	0.03%	0	0.00%	4



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Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
European starling	951	8.51%	408	3.65%	5	0.04%	62	0.55%	1426
field sparrow	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
golden-crowned kinglet	0	0.00%	0	0.00%	0	0.00%	1	0.01%	1
great blue heron	5	0.04%	2	0.02%	0	0.00%	0	0.00%	7
great crested flycatcher	3	0.03%	0	0.00%	0	0.00%	0	0.00%	3
great horned owl	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
grey catbird	12	0.11%	0	0.00%	0	0.00%	0	0.00%	12
gull species	0	0.00%	2	0.02%	0	0.00%	0	0.00%	2
hairy woodpecker	2	0.02%	0	0.00%	0	0.00%	1	0.01%	3
hermit thrush	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
herring gull	4	0.04%	5	0.04%	0	0.00%	0	0.00%	9
horned lark	241	2.16%	23	0.21%	0	0.00%	15	0.13%	279
house finch	7	0.06%	1	0.01%	0	0.00%	0	0.00%	8
house sparrow	118	1.06%	11	0.10%	0	0.00%	6	0.05%	135
house wren	3	0.03%	0	0.00%	2	0.02%	0	0.00%	5
indigo bunting	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
killdeer	71	0.64%	11	0.10%	1	0.01%	3	0.03%	86
Lapland longspur	5	0.04%	0	0.00%	0	0.00%	0	0.00%	5
least flycatcher	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Lincoln's sparrow	3	0.03%	0	0.00%	0	0.00%	0	0.00%	3
magnolia warbler	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
mallard	33	0.30%	1	0.01%	0	0.00%	1	0.01%	35
mourning dove	48	0.43%	6	0.05%	0	0.00%	4	0.04%	58



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Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
mourning warbler	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Nashville warbler	7	0.06%	0	0.00%	0	0.00%	0	0.00%	7
northern cardinal	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
northern flicker	10	0.09%	2	0.02%	0	0.00%	0	0.00%	12
northern harrier	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
northern rough-winged swallow	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
northern waterthrush	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
orange-crowned warbler	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
ovenbird	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
palm warbler	6	0.05%	0	0.00%	0	0.00%	0	0.00%	6
Philadelphia vireo	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
pileated woodpecker	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
purple martin	0	0.00%	1	0.01%	0	0.00%	1	0.01%	2
red-bellied woodpecker	4	0.04%	1	0.01%	0	0.00%	0	0.00%	5
red-breasted nuthatch	1	0.01%	0	0.00%	0	0.00%	1	0.01%	2
red-eyed vireo	1	0.01%	0	0.00%	3	0.03%	0	0.00%	4
red-tailed hawk	10	0.09%	11	0.10%	1	0.01%	1	0.01%	23
red-winged blackbird	324	2.90%	47	0.42%	1	0.01%	25	0.22%	397
ring-billed gull	147	1.32%	440	3.94%	0	0.00%	4	0.04%	591
rock pigeon	128	1.15%	6	0.05%	0	0.00%	0	0.00%	134
rose-breasted grosbeak	5	0.04%	0	0.00%	1	0.01%	1	0.01%	7
rough-legged hawk	7	0.06%	2	0.02%	0	0.00%	0	0.00%	9
ruby-crowned kinglet	13	0.12%	0	0.00%	0	0.00%	0	0.00%	13



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Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
ruby-throated hummingbird	6	0.05%	1	0.01%	0	0.00%	0	0.00%	7
rusty blackbird	4	0.04%	1	0.01%	0	0.00%	0	0.00%	5
sandhill crane	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
savannah sparrow	37	0.33%	0	0.00%	1	0.01%	0	0.00%	38
scarlet tanager	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
sharp-shinned hawk	4	0.04%	4	0.04%	1	0.01%	0	0.00%	9
snow bunting	114	1.02%	40	0.36%	0	0.00%	0	0.00%	154
song sparrow	76	0.68%	0	0.00%	1	0.01%	2	0.02%	79
spotted sandpiper	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
Swainson's thrush	2	0.02%	4	0.04%	0	0.00%	0	0.00%	6
swamp sparrow	8	0.07%	0	0.00%	0	0.00%	0	0.00%	8
Tennessee warbler	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
tree swallow	614	5.49%	26	0.23%	0	0.00%	1	0.01%	641
turkey vulture	7	0.06%	516	4.62%	5	0.04%	4	0.04%	532
upland sandpiper	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
veery	0	0.00%	0	0.00%	1	0.01%	0	0.00%	1
vesper sparrow	11	0.10%	0	0.00%	0	0.00%	0	0.00%	11
warbling vireo	1	0.01%	2	0.02%	0	0.00%	1	0.01%	4
white-breasted nuthatch	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
white-crowned sparrow	3	0.03%	0	0.00%	0	0.00%	0	0.00%	3
white-throated sparrow	103	0.92%	0	0.00%	0	0.00%	0	0.00%	103
wild turkey	10	0.09%	0	0.00%	0	0.00%	0	0.00%	10
willow flycatcher	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0



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Species Common Name	Under 30m		Within 30-130m		Over 130m		Height Unknown		Total
	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals	Percent Composition	Number of Individuals
Wilson's warbler	2	0.02%	0	0.00%	0	0.00%	0	0.00%	2
winter wren	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
wood duck	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
wood thrush	1	0.01%	0	0.00%	0	0.00%	0	0.00%	1
yellow warbler	8	0.07%	0	0.00%	0	0.00%	0	0.00%	8
yellow-bellied flycatcher	3	0.03%	0	0.00%	0	0.00%	0	0.00%	3
yellow-bellied sapsucker	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
yellow-rumped warbler	23	0.21%	2	0.02%	0	0.00%	0	0.00%	25
yellow-throated vireo	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
Grand Total	5644	50.51%	2305	20.63%	54	0.48%	215	1.92%	11175



3.1 Flight Heights of Birds during All Avian Use Surveys in 2010

During the study, a total of 11,175 individual bird observations were made (Table 3). Of these, 8,218 were observed in flight (Table 6 and 7). Passerines comprised 74.83% of all individuals (Table 4).

With respect to the flying birds, the majority of these birds were observed at a flight height below the turbine sweep or <30m (68.69%), followed by the group flying within the turbine sweep or 30-130m (28.05%). The group flying above the turbine sweep or >130m accounted for less than 1% of the observed flying birds (0.66%; Table 6). Of those observed flying within the turbine sweep the majority were turkey vulture (516 individual observations), followed by ring-billed gull, European starling, Canada goose, blue jay, American crow and common grackle (440, 408, 205, 196, 79 and 73 individual observations respectively; Table 7). The great majority of these observations were during the fall migration.

3.2 Winter Avian Use Surveys

A total of 665 individual observations of 23 species were made during winter bird surveys in January and February 2010 (Table 3). The most abundant species observed in the Avian Study Area during the winter were European starling (*Sturnus vulgaris*), American crow (*Corvus brachyrhynchos*), horned lark (*Eremophila alpestris*) and snow bunting (*Plectrophenax nivalis*) comprising of 23.61%, 21.65%, 18.65% and 15.64% of all winter birds, respectively.

During winter surveys, passerines, raptors and woodpeckers flew at an average height of less than 30 m (below the rotor blade sweep), the few waterbirds that were observed flew at an average height of 35 m (within the rotor blade sweep) and there was no data to indicate the average flight height of the other bird groups (Table 5).

3.3 Spring Migration Avian Use Surveys

A total of 2897 individual observations of 82 species were identified during spring migration bird surveys in April and May 2010 (Table 3). The most common species observed in the Avian Study Area during spring migration were ring-billed gull (*Larus delawarensis*), red-winged blackbird (*Agelaius phoeniceus*), European starling, blue jay (*Cyanocitta cristata*) common grackle (*Quiscalus quiscula*), and American robin (*Turdus migratorius*) comprising of 27.93%, 7.84%, 7.08%, 6.87%, 6.59% and 6.39% of all birds, respectively. Passerines and waterbirds were the largest groups, comprising 61.86% and 28.62% of all spring observations respectively (Table 4).

Most bird groups flew at an average height of less than 30 m during spring surveys (Table 5). However, raptors and waterbirds flew at average heights within the limits of the turbine blades (73.14 and 35.15m, respectively). The vast majority of these individuals were turkey vultures (*Cathartes aura*) and ring-billed gulls, both of which species were often in flocks.

3.4 Breeding (Summer) Avian Use Surveys

A total of 1909 individual observations of 70 species were identified during breeding bird surveys in June 2010 (Table 3). The most common species observed in the Avian Study Area during the breeding season were European starling, red-winged blackbird, common grackle, turkey vulture and American robin, and comprising 12.52%, 8.96%, 8.64%, 6.65% and 4.98% of all summer birds, respectively.

Summer flight heights manifested the same pattern as had been seen during the spring, the majority of bird groups flying below the 30m sweep zone of wind turbine blades (Table 5). Only raptors and waterbirds flew at



average heights within the limits of the turbine blades (82.88m and 42.22m, respectively). As in spring, the great majority of these individuals were turkey vultures and ring-billed gulls, both of which species were often in flocks.

3.5 Fall Migration Avian Use Surveys

A total of 5704 individual observations of 96 species were identified during fall migration bird surveys in August, September, October and November 2010 (Table 3). The most common species observed in the Avian Study Area during the fall were European starling, tree swallow (*Tachycineta bicolor*), ring-billed gull, Canada goose and American crow, comprising 19.65%, 10.75%, 8.45%, 8.05% and 6.42% of all migratory birds, respectively.

As in previous seasons, the majority of birds, including passerines, shorebirds and woodpeckers, flew below the height of wind turbine rotor blades (Table 5). However, the waterfowl group joined the raptors and waterbirds as cohorts that flew at average heights within the sweep of the turbine blades (at 48.03m, 74.79m and 54.87m, respectively). As in previous seasons, the majority of these individuals were turkey vultures and ring-billed gulls.

3.6 Spring Tundra Swan/Waterfowl Surveys

A separate survey was conducted to observe tundra swans and other waterfowl within the Avian Study Area on 18 March 2010. During this survey, one small flock of 80 tundra swan were located feeding in field at the eastern edge of the Avian Study Area (Figure 2). No other waterfowl were observed on the Project Area during this survey. Other taxa observed during these surveys included common agricultural landscape species such as ring-billed gull (*Larus delawarensis*), European starling and horned lark (*Eremophila alpestris*). Four raptor species were observed; including one northern harrier (*Circus cyaneus*), four red-tailed hawks (*Buteo jamaicensis*), five broad-winged hawks (*Buteo platypterus*) and a sharp-shinned hawk (*Accipiter striatus*). Broad-winged hawks are the only species observed during these surveys that was not observed during other avian use surveys.



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3.7 Species at Risk

In this report, Species at Risk (SAR) are those species that are listed under the Federal *Species at Risk Act* (SARA) or the Ontario *Endangered Species Act* (ESA). During 2010 avian surveys, five SAR were observed within the Avian Study Area. All species at risk observed within the Avian Study Area during surveys in 2010 are tabulated in Table 8. Species listed as Special Concern are also summarized in Table 8 but are dealt with in a separate subsection below, given their reduced regulatory status.

Table 8: Endangered, Threatened and Special Concern Avian Species Observed Within the Study

Location of Observation (Station #) *	Season of Observation	Common Name	Scientific Name	SARA Listing (Schedule 1)	ESA Listing	Count
Station 01	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	2
	Fall	bald eagle	<i>Haliaeetus leucocephalus</i>	Not Listed	Special concern	1
	Spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	3
Station 04	Fall	bald eagle	<i>Haliaeetus leucocephalus</i>	Not Listed	Special concern	1
	Fall	Bobolink	<i>Euphagus carolinus</i>	Special concern	Not Listed	2
Station 05	Fall	bald eagle	<i>Haliaeetus leucocephalus</i>	Not Listed	Special concern	1
	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	3
Station 06	Fall	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	1
Station 07	Spring	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	2
	Fall	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	5
Station 09	Spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	Breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	2
	Fall	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	1
	winter	bald eagle	<i>Haliaeetus leucocephalus</i>	Not Listed	Special concern	1
Station 10	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	3
Station 11	breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	4
Station 13	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	4
	breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	3



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Location of Observation (Station #) *	Season of Observation	Common Name	Scientific Name	SARA Listing (Schedule 1)	ESA Listing	Count
Station 14	breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	breeding	chimney swift	<i>Chaetura pelagica</i>	Threatened	Threatened	2
Station 17	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
Station 18	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	4
Station 19	Fall	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	1
	winter	bald eagle	<i>Haliaeetus leucocephalus</i>	Not Listed	Special concern	1
Station 20	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	6
	breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	5
	Fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	Fall	chimney swift	<i>Chaetura pelagica</i>	Threatened	Threatened	1
Station 21	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	7
	fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	3
Station 22	fall	rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Not Listed	2
Station 23	spring	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
Station 24	fall	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	1
	breeding	Bobolink	<i>Dolichonyx oryzivorus</i>	Not Listed	Threatened	2



3.7.1 Special Concern Species

Two Special Concern species were identified during avian surveys in 2010. These are the bald eagle (*Haliaeetus leucocephalus*) and rusty blackbird (*Euphagus carolinus*). Bald eagle is listed as Special Concern under ESA and not listed under SARA. Rusty blackbird is listed as Special Concern under SARA and not listed under ESA.

The bald eagle observations included two during winter surveys in February 2010 and three during fall migration surveys in October and November 2010. One bird was observed flying at an average height of less than 30 m in an agricultural area. During fall migration two birds were observed soaring at an average height above 30 m and less than 130 m in an agricultural area. In addition two individuals of various ages were observed perched in a tree in an agricultural area.

Two rusty blackbirds were observed during spring migration surveys in April 2010 and ten were observed during fall migration surveys in October and November 2010. Four individuals were seen flying low over agricultural fields and one individual was flying just above the 30 m average for the bottom of the potential rotor impact zone. Seven individuals were seen perched in a deciduous woodlot.

3.7.2 Threatened and Endangered Species

Two Threatened species and no Endangered species were identified during avian surveys in 2010. These are bobolink (*Dolichonyx oryzivorus*) and chimney swift (*Chaetura pelagica*). Bobolink is listed as Threatened under ESA but is not listed under SARA and chimney swift is listed as Threatened under both SARA and ESA.

The bobolink sightings included 27 individual observations during spring migration surveys, 21 observations during fall migration and 13 individual observations during breeding season surveys. Fifty-five observations were made of flying birds and the numbers were nearly evenly split between birds flying below 30m (27 individuals) and birds flying above 30m (26 individuals), with two birds seen too briefly to estimate flying height (Table 7). Six birds were observed perched, in pasture, agricultural fields or small meadows.

Three chimney swifts were seen flying between 30 m and 40 m above the ground, two during the breeding season surveys in June 2010 and one during the fall migration surveys in October and November 2010.

3.8 Other Species of Conservation Concern

In addition to SAR, there are several other groups of species that can be considered to be of conservation concern by the scientific and conservation community in Ontario. This includes species listed as rare or imperilled in Ontario by the NHIC; species that have been identified as at risk by COSEWIC; species identified as conservation priorities by Partners in Flight (PIF); area sensitive species; shorebirds identified as conservation priorities by the Ontario Shorebird Conservation Plan (OSCP); and waterfowl with declining long term population trends as described by the North American Waterfowl Management Plan (NAWMP). Species identified during 2010 surveys within the Avian Study Area that fall into one or more of these categories are summarized in Table 9.

Within Ontario the NHIC is responsible for assigning species abundance ranks (S-rank) to all biological organisms occurring in the province and tracking those species with S-ranks of three or lower (S1, S2 and S3) within the province. Species with a ranking of S1-S3 are considered vulnerable or rare, with S1 being the most imperilled (OMNR 2010). Three species identified within the Avian Study Area in 2010 fall into this category.



This includes two overwintering birds, the rough-legged hawk (*Buteo lagopus*) and the Lapland longspur (*Calcarius lapponicus*), as well as one possible breeder within the Avian Study Area, bald eagle (Table 9).

COSEWIC is a committee made up of various governmental, non-governmental, aboriginal and other organizations, whose role is to determine the national status of wild species that may be at risk in Canada. This process is the first step in a species becoming listed under SARA. However not all species listed by COSEWIC are automatically listed in SARA. This is because COSEWIC does not consider non ecological issues such as socioeconomic and cultural matters; this role is played by the federal government of Canada (COSEWIC 2010). No species identified within the Avian Study Area in 2010 are listed by COSEWIC that are not already listed by SARA or ESA (Table 9).

Area sensitive species are those species listed in the Bird Studies Canada report, *Conservation Priorities for the Birds of Southern Ontario*. Criteria for identifying these species are based on whether the presence or absence of a given species is closely related to the amount of available breeding habitat in a given spatial unit. That is, those species that only breed in areas containing larger amounts of a specific habitat type are considered area sensitive. These species may require special consideration in development activities (Couturier 1999). A total of 47 species that are considered area sensitive were identified within the Avian Study Area in 2010 (Table 9). This includes forest species such as pileated woodpecker (*Dryocopus pileatus*), thicket and shrubland species such as brown thrasher (*Toxostoma rufum*) and open area species such as savannah sparrow (*Passerculus sandwichensis*).

The PIF Ontario Landbird Conservation Plan for Bird Conservation Region (BCR) 13 was prepared to help guide management and conservation efforts of bird populations that are found within the Great Lakes- St. Lawrence Region of Ontario which includes the Avian Study Area. The Landbird Conservation Plan includes a list of priority species for this region (PIF 2008). A total of 18 species identified in the Avian Study Area during 2010 field surveys are designated as Landbird Conservation Plan priority species. This includes species such as American kestrel, Baltimore oriole (*Icterus galbula*), and vesper sparrow (*Proecetes gramineus*). These priority species also include some species that are listed as SAR such as bald eagle and chimney swift (Table 9).

The Canadian Wildlife Service (CWS) Ontario Shorebird Conservation Plan identifies shorebirds with a high conservation priority, based on a number of factors such as declining abundance and threats to breeding habitats by anthropogenic disturbance (CWS 2003). One shorebird species of high priority, the upland sandpiper (*Bartramia longicauda*), was identified within the Avian Study Area during 2010 field surveys (Table 9).

The North American Waterfowl Management Plan (NAWMP) is a joint project of Canada, United States, and Mexico (NAWMP 2004). This plan tracks long term population trends of North American Waterfowl. Although the majority of waterfowl are showing no trend or increasing, some species are showing a long-term decline and are therefore conservation priorities (NAWMP 2004). No declining waterfowl species were identified during 2010 field surveys (Table 9).



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Table 9: Avian Species of Conservation Concern Identified within the Study Area

Common Name	Scientific Name	Total	Ontario S-Rank ^a	COSEWIC ^b	SARA (Sch 1) ^c	ESA ^d	Area Sensitive Species in Southern Ontario ^e	Priority Landbird Species BCR13 ^f	Priority Shorebird Species for BCR13 ^g	Declining Waterfowl Species in North America ^h
American goldfinch	<i>Carduelis tristis</i>	285	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
American kestrel	<i>Falco sparverius</i>	8	S4	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
American redstart	<i>Setophaga ruticilla</i>	10	S5B	Not Listed	Not Listed	Not Listed	Yes	No	No	No
bald eagle	<i>Haliaeetus leucocephalus</i>	5	S2N,S4B	Not at Risk	Not Listed	Special Concern	NO	YES	NO	NO
Baltimore oriole	<i>Icterus galbula</i>	37	S4B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
bank swallow	<i>Riparia riparia</i>	57	S4B	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
barn swallow	<i>Hirundo rustica</i>	400	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
belted kingfisher	<i>Ceryle alcyon</i>	3	S4B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
black-and-white warbler	<i>Mniotilta varia</i>	1	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
blackburnian warbler	<i>Dendroica fusca</i>	2	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
black-throated green warbler	<i>Dendroica virens</i>	3	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
blue-headed vireo	<i>Vireo solitarius</i>	4	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
bobolink	<i>Dolichonyx oryzivorus</i>	61	S4B	Threatened	Not Listed	Threatened	YES	YES	NO	NO
brown creeper	<i>Certhia americana</i>	1	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
brown thrasher	<i>Toxostoma rufum</i>	17	S4B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
brown-headed cowbird	<i>Molothrus ater</i>	172	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
chimney swift	<i>Chaetura pelagica</i>	3	S4B,S4N	Threatened	Threatened	Threatened	NO	YES	NO	NO
cliff swallow	<i>Petrochelidon pyrrhonota</i>	170	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
cooper's hawk	<i>Accipiter cooperii</i>	3	S4	Not at Risk	Not Listed	Not Listed	YES	NO	NO	NO
dark-eyed junco	<i>Junco hyemalis</i>	49	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
eastern bluebird	<i>Sialia sialis</i>	6	S5B	Not at Risk	Not Listed	Not Listed	YES	NO	NO	NO
eastern kingbird	<i>Tyrannus tyrannus</i>	14	S4B	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
eastern meadowlark	<i>Sturnella magna</i>	2	S4B	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
eastern wood-pewee	<i>Contopus virens</i>	10	S4B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
field sparrow	<i>Spizella pusilla</i>	3	S4B	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
golden-crowned kinglet	<i>Regulus satrapa</i>	13	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
hermit thrush	<i>Catharus guttatus</i>	2	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
horned lark	<i>Eremophila alpestris</i>	363	S5B	Not Listed	Not Listed	Not Listed	Yes	No	No	No
Lapland longspur	<i>Calcarius lapponicus</i>	10	S3B	Not Listed	Not Listed	Not Listed	NO	NO	NO	NO
mourning warbler	<i>Oporornis philadelphia</i>	1	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
Nashville warbler	<i>Vermivora ruficapilla</i>	11	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
northern flicker	<i>Colaptes auratus</i>	44	S4B	Not Listed	Not Listed	Not Listed	No	Yes	No	No
northern harrier	<i>Circus cyaneus</i>	2	S4B	Not at Risk	Not Listed	Not Listed	YES	YES	NO	NO
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	36	S4B	Not Listed	Not Listed	Not Listed	Yes	No	No	No
northern waterthrush	<i>Seiurus noveboracensis</i>	1	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO



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Common Name	Scientific Name	Total	Ontario S-Rank ^a	COSEWIC ^b	SARA (Sch 1) ^c	ESA ^d	Area Sensitive Species in Southern Ontario ^e	Priority Landbird Species BCR13 ^f	Priority Shorebird Species for BCR13 ^g	Declining Waterfowl Species in North America ^h
ovenbird	<i>Seiurus aurocapilla</i>	6	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
pileated woodpecker	<i>Dryocopus pileatus</i>	3	S5	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
red-bellied woodpecker	<i>Melanerpes carolinus</i>	10	S4	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
red-breasted nuthatch	<i>Sitta canadensis</i>	5	S5	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
red-winged blackbird	<i>Agelaius phoeniceus</i>	494	S4	Not Listed	Not Listed	Not Listed	NO	NO	NO	NO
rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	29	S4B	Not Listed	Not Listed	Not Listed	No	Yes	No	No
rough-legged hawk	<i>Buteo lagopus</i>	10	S1B,S4N	Not at Risk	Not Listed	Not Listed	NO	NO	NO	NO
ruby-crowned kinglet	<i>Regulus calendula</i>	13	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
rusty blackbird	<i>Euphagus carolinus</i>	12	S4B	Special Concern	Special Concern	Not Listed	NO	NO	NO	NO
sandhill crane	<i>Grus canadensis</i>	1	S5B	Not at Risk	Not Listed	Not Listed	YES	NO	NO	NO
savannah sparrow	<i>Passerculus sandwichensis</i>	128	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
scarlet tanager	<i>Piranga olivacea</i>	5	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
sharp-shinned hawk	<i>Accipiter striatus</i>	9	S5	Not at Risk	Not Listed	Not Listed	YES	NO	NO	NO
spotted sandpiper	<i>Actitis macularia</i>	2	S5	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
Swainson's thrush	<i>Catharus ustulatus</i>	7	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
turkey vulture	<i>Cathartes aura</i>	532	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
upland sandpiper	<i>Bartramia longicauda</i>	2	S4B	Not Listed	Not Listed	Not Listed	YES	NO	YES	NO
veery	<i>Catharus fuscescens</i>	1	S4B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
vesper sparrow	<i>Poocetes gramineus</i>	48	S4B	Not Listed	Not Listed	Not Listed	YES	YES	NO	NO
white-throated sparrow	<i>Zonotrichia albicollis</i>	130	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
wild turkey	<i>Meleagris gallopava</i>	11	S5	Not Listed	Not Listed	Not Listed	No	No	No	No
willow flycatcher	<i>Empidonax traillii</i>	1	S5B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
winter wren	<i>Troglodytes troglodytes</i>	1	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
wood duck	<i>Aix sponsa</i>	2	S5	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
wood thrush	<i>Hylocichla mustelina</i>	24	S4B	Not Listed	Not Listed	Not Listed	NO	YES	NO	NO
yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	4	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
yellow-rumped warbler	<i>Dendroica coronata</i>	28	S5B	Not Listed	Not Listed	Not Listed	YES	NO	NO	NO
Total:		3327								

a - Provincial (or Subnational) ranks, used by the Natural Heritage Information Centre to set protection priorities for rare species and natural communities; retrieved from the NHIC Biodiversity Explorer.

b - COSEWIC 2010. Committee on the Status of Endangered Wildlife in Canada. http://www.cosewic.gc.ca/eng/sct5/index_e.cfm

c - Species at Risk Act, 2002. <http://laws.justice.gc.ca/en/S-15.3/text.html>

d - Endangered Species Act, 2007. http://www.elaws.gov.on.ca/html/statutes/english/elaws_statutes_07e06_e.htm

e - Conservation Priorities for the Birds of Southern Ontario, Part 2, page A25

f - Ontario Partners in Flight (PIF). 2008. Ontario Landbird Conservation Plan: Lower Great Lakes/St. Lawrence Plain, North American Bird Conservation Region 13. Ontario Ministry of Natural Resources, Bird Studies Canada, Environment Canada. Draft Version 2.0. Table 3, page 23.

g - Ontario Shorebird Conservation Plan. Environment Canada, Canadian Wildlife Service. <http://www.on.ec.gc.ca/wildlife/plans/pdf/plans-shorebird-e.pdf>

h - North American Waterfowl Management Plan: Strengthening the Biological Function 2004 Strategic Guidance. <http://www.nawmp.ca/pdf/04update-en.pdf> Table, 2 pages 8-9.



4.0 DISCUSSION

4.1 Direct Effects

The main direct effect of wind power projects on birds is mortality due to collision with the wind turbines. Background information reviewed and field studies undertaken have suggested that, although the Avian Study Area is located within the Mississippi and Atlantic migratory flyways for birds, intensive agricultural practices during the twentieth century have reduced suitable staging and roosting habitat for many species. In addition, the majority of birds moving within the Avian Study Area flew below and above the rotor sweep (<30m, and >130m). Although about 20% of birds in the study area were observed flying within the rotor sweep (30-130m), the majority of these were accounted for by a few common species such as ring-billed gull. Of the 17 observations of the two Special Concern species within the study area only three were within the rotor sweep. Of the 64 observations of the two Threatened species observed in the study area, 29 were within the rotor sweep zone. Several recent scientific studies on turbine related mortalities (e.g., Osborn *et al.*, 2000; Johnson *et al.*, 2003; Barrios and Rodríguez 2004; Echotrack 2005; Erickson *et al.* 2001; Drewitt and Langston 2006) indicate that with careful siting of wind turbines, the potential for direct avian mortality during operation of the Project is likely to be limited.

4.2 Indirect Effects

For most wind projects, the indirect effects arising from the loss, fragmentation, or disturbance of habitat during the construction, operation, and maintenance of the wind energy facility have a larger potential to negatively affect birds than the direct mortality discussed above. An effective tool in minimizing potential indirect effects, especially to wetlands and woodlands, is to avoid, wherever possible, construction of turbines and ancillary facilities in or across any remnant natural habitats. Since windfarm components utilize primarily open agricultural lands, they do not add significantly to forest fragmentation.

Sensory disturbance (visual and auditory) arising from site preparation and construction activities may result in, under exceptional circumstances, temporary habitat alienation, displacement, or nest desertion. Studies in the Netherlands suggest that landbird, and specifically woodland songbird, population densities begin to decline at an average noise level of 42 dB (Reijnen *et al.*, 1996). Forman and Hersperger (1996) suggest that noise associated with traffic can affect bird populations by disrupting vocal communication required for mate selection, mate location, foraging communication, predator detection and avoidance and parent-nestling communication. However, within the study area these disturbances are likely intermittent and the local bird communities will have adapted to local traffic and farm equipment noise.

Species that are thought to be the most sensitive to disturbance, as a result of habitat fragmentation, include area-sensitive species. Installation of wind turbines in existing agricultural lands is expected to have a limited effect on area sensitive bird habitat, since we have assumed that no permanent natural vegetation (woodlots and wetlands) will be removed to install and operate the wind turbines in the project area.



5.0 CONCLUSIONS AND RECOMMENDATIONS

The Avian Study Area supports a relatively diverse community of birds that are typical of agricultural landscapes in southwestern Ontario including some Special Concern and Threatened species.

With careful siting of turbines, such as the avoidance of habitats that support known SAR and other species of conservation concern, of large woodlots, wetlands, valley lands and riparian areas where naturally-occurring vegetation is present, the potential for direct and indirect avian mortality during operation of the project can be minimized.

6.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please contact the undersigned.



Report Signature Page

GOLDER ASSOCIATES LTD.

Derek Morningstar, B.Sc.
Terrestrial Ecologist

Kevin Trimble, M.Sc.
Principal, Senior Ecologist

DM/LO/FN/KT/am

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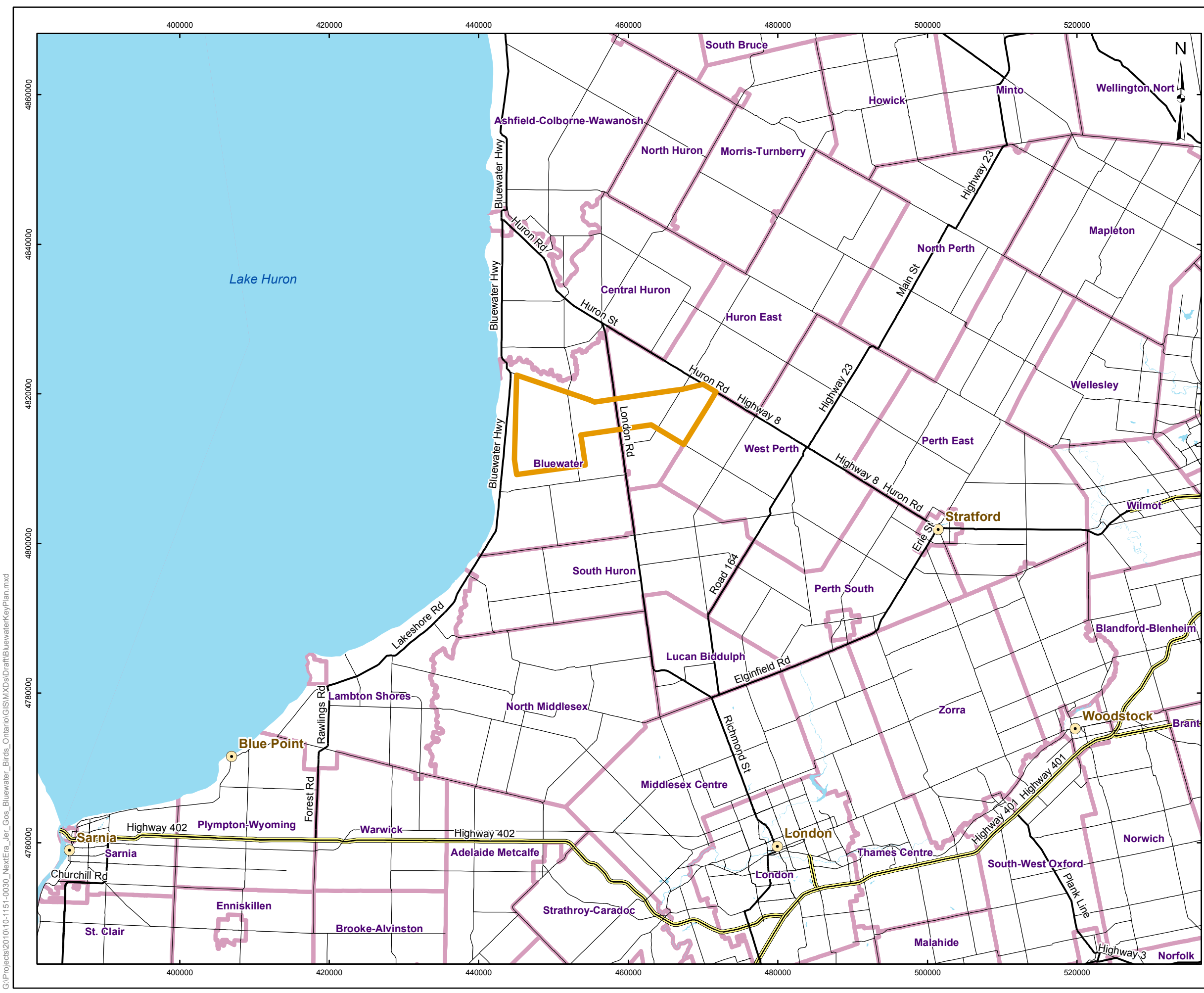


AVIAN USE MONITORING REPORT - BLUEWATER WIND ENERGY PROJECT

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FIGURES



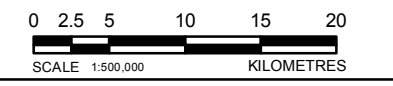
LEGEND

- Community
- Project Area
- Expressway
- Highway
- Major Road
- Municipality

REFERENCE

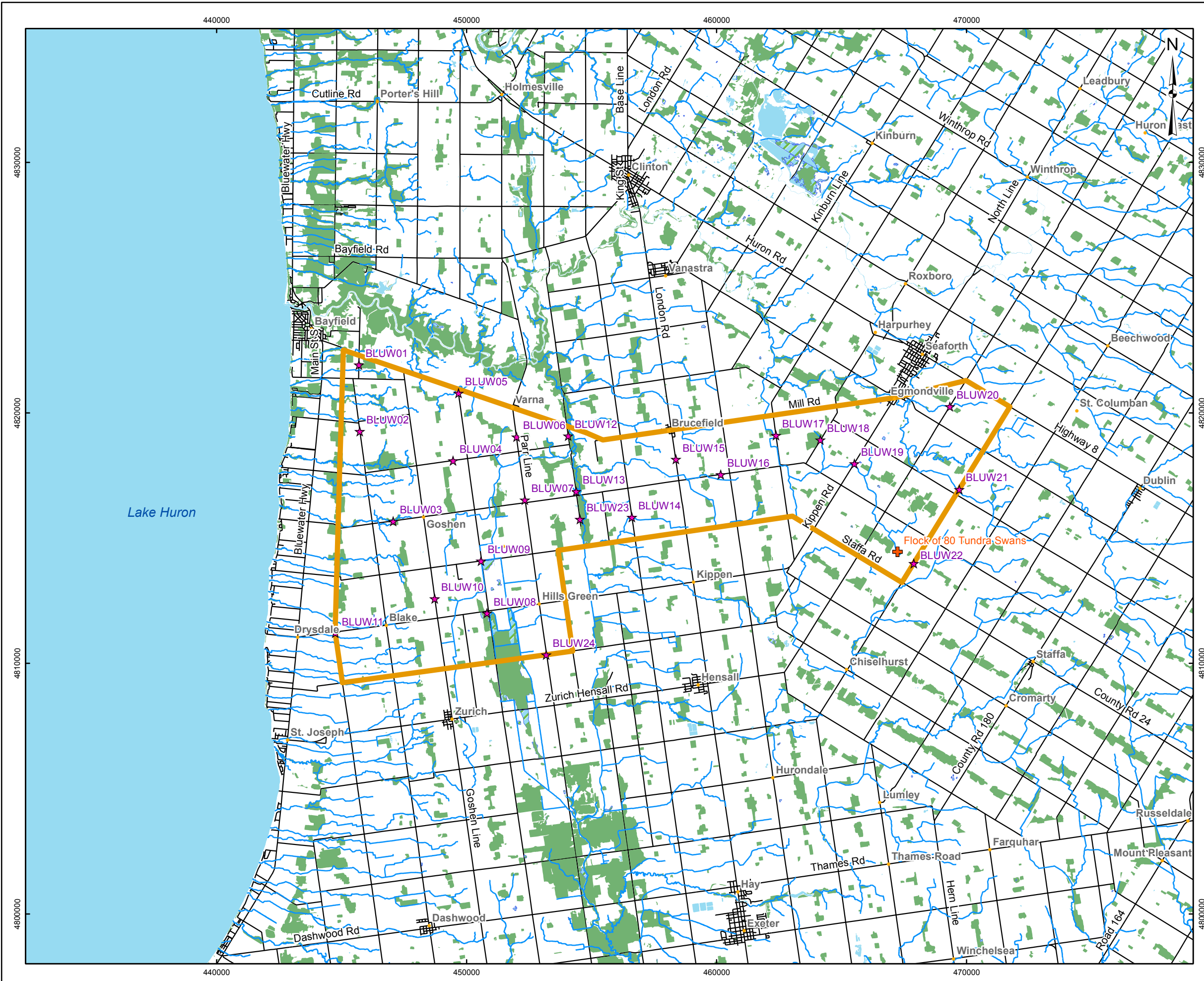
Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
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DRAFT



PROJECT			
NEXTERA JERICO, GOSHEN AND BLUEWATER WIND FARMS AVIAN MONITORING			
TITLE			
BLUEWATER KEY PLAN			
	PROJECT NO.	10-1151-0030	SCALE AS SHOWN
	DESIGN	PP 19 Jan. 2010	REV.
	CHECK	PP 4 Jan. 2011	
	REVIEW		
			FIGURE: 1

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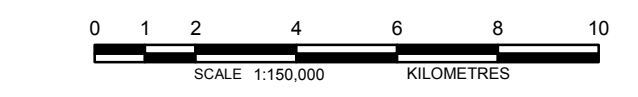
LEGEND

- ★ Bird Survey Location
- ✚ Flock of 80 Tundra Swans
- Community
- ▭ Project Area
- Watercourse
- Wooded Area
- Waterbody
- ▨ Wetland
- Road



REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
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PROJECT		NEXTERA JERICO, GOSHEN AND BLUEWATER WIND FARMS AVIAN MONITORING	
TITLE		BLUEWATER AVIAN MONITORING	
PROJECT NO. 10-1151-0030		SCALE AS SHOWN	REV.
DESIGN	PP	19 Jan. 2010	
GIS	JMC	8 Dec. 2011	
CHECK	DM	8 Dec. 2011	
REVIEW	DM	8 Dec. 2011	

FIGURE: 2



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Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
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solutions@golder.com
www.golder.com

Golder Associates Ltd.
2390 Argentia Road
Mississauga, Ontario, L5N 5Z7
Canada
T: +1 (905) 567 4444

