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Saturn Power Inc.

Renewable Energy Approval Report

Volume 1 - Main Report

Gesner Wind Energy Project

H328628-0000-07-124-0001
Rev. F
October 2011

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Project Report

October 6, 2011

Saturn Power Inc.
Gesner Wind Energy Project

Renewable Energy Approval Report

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1 Project Description

1. Project Description

Note: A separate Project Description Report (PDR) was prepared for the Ministry of the Environment, and is enclosed within Appendix K of this Report.

1.1 Introduction

Saturn Power Inc. ("Saturn") is proposing to build a 10-megawatt (MW) wind energy project southeast of Highgate, in the Municipality of Chatham-Kent, in southwestern Ontario. The wind farm will be located approximately 10 km inland from the northwestern shore of Lake Erie. The 10-MW project will consist of five 2-MW wind turbine generators (WTGs).

1.1.1 Renewable Energy Approval requirements

This environmental assessment (EA) report is submitted in support of an application to the Ontario Ministry of the Environment (MOE) for a Renewable Energy Approval (REA). Wind facilities, at a location where no part of a wind turbine is located in direct contact with surface water other than a wetland, with a name plate capacity of ≥50 kW, and a greatest sound power level of <102 dBA, such as those proposed by Saturn Power, are classified as Class 3 wind facilities. The construction, installation, use, and operation of a Class 3 wind facility are a prescribed activity under Section 10 of Ontario Regulation (O.Reg.) 359/09 – Renewable Energy Approvals under Part V.0.1 of the (Environmental Protection) Act, which, therefore, requires that the Project receive a REA prior to construction. The requirements for obtaining REA approval are outlined in O.Reg. 359/09 (the "Regulation").

O.Reg. 359/09 and the revised text of the Environmental Protection Act were officially enacted on September 24, 2009. At that time, the Gesner Wind Energy Project ("the Project") was well advanced in the former (EA) process. As a result, Hatch was able to obtain dispensation from MOE to produce a report consistent with the former EA process, while identifying, within the form of a table, where the information requirements outlined in O.Reg. 359/09 can be found. This table is provided in Appendix B of this report, while a summary is provided in Table 1.1.

Table 1.1 Information Requirements of the REA Process

Description	Details Required	Report Section
Construction Plan	• Construction activities • Location and timing of activities • Environmental effects and mitigation measures.	Sections 4.1, 4.3 & 4.4
Decommissioning Plan	• Dismantling or demolition procedures • Restoration activities • Waste management procedures	Section 4.6
Design and Operations	• Site plan • Description of facilities • Map of environmental features • Waste management procedures • Environmental effects monitoring plans • Response plans	Section 4 Section 5

Description	Details Required	Report Section
Wind Turbine Specifications	• N/A	Section 1.3.2 Appendix A
Natural Heritage Features	• Description of natural heritage features • Results of site investigations • Evaluation of significance of natural heritage features • Impact assessment of natural heritage features	Section 3 Section 4
Water Bodies	• Description of waterbodies • Results of site investigations • Impact assessment of waterbodies	Section 3 Section 4

1.1.2 Organization of this Report

This EA report is divided into eight sections, briefly described below:

- Section 1 (this section) – provides an introduction to the report and a brief description of the Project.
- Section 2 – provides the scope and methodology of the EA.
- Section 3 – describes information on the existing natural and socioeconomic environment of the area, including results of site investigations.
- Section 4 – provides details on the Project activities; identifies impacts, mitigation measures and residual effects to the natural and socioeconomic environment; assesses the significance of any residual effects; describes a decommissioning plan; identifies potential accidents and malfunctions, and measures to address them; and assesses the effects of the environment on the Project.
- Section 5 – describes the environmental monitoring programs to be used during pre-construction, construction, and operations phases of the Project.
- Section 6 – identifies the environmental approvals and permits required for the Project.
- Section 7 – provides the conclusions of the EA, and recommendations with respect to the Project.
- Section 8 – lists references used in this report.

1.2 General Information on the Project

The name and proposed location of the Project is Gesner Wind Energy Project near Highgate, Ontario (Figure 1.1). Figure 1.1 also shows the biological study area.

The agencies and organizations shown in Table 1.2 are among the entities which were consulted during the REA process.

Table 1.2 Government Agencies and Organizations to be Contacted

Federal Government	Municipal Government
Canadian Environmental Assessment Agency (CEAA) Environment Canada (EC) Fisheries and Oceans Canada (DFO) Health Canada Indian and Native Affairs Canada (INAC) Natural Resources Canada (NRCan) Transport Canada (Marine)	Corporation of the Municipality of Chatham-Kent Chatham Kent Economic Development Services Town of Highgate County of Elgin Ridgetown Municipal Office
	First Nations
	Moravian of the Thames First Nation Walpole Island First Nation Oneida Nation of the Thames Caldwell First Nation Munsee-Delaware Nation Chippewas of the Thames First Nation
Provincial Government	**Industry/Commercial Stakeholders**
Ministry of Culture Ministry of Community and Social Services Ministry of the Environment (MOE) Ministry of Natural Resources (MNR) Ministry of Northern Development and Mines Ministry of Transportation Ministry of Aboriginal Affairs Rondeau Provincial Park	Hydro One Networks Inc. (HONI) Chatham-Kent Energy Chatham-Kent Chamber of Commerce Friends of Rondeau Park Jack Miner Migratory Bird Foundation Lower Thames Valley Conservation Authority Ontario Energy Association Ridgetown Chamber of Commerce

1.2.1 Contacts

Saturn is an Ontario-based company that develops renewable energy projects. Contact information for Saturn is as follows:

Dave Patterson, Project Developer
Saturn Power Inc.
Box 6087
New Hamburg, ON, N3A 2K6

Tel: 519-804-9163
Fax: 519-220-5912
Email: dave@saturnpower.ca

Hatch Ltd. (Hatch) has been retained by Saturn to conduct the environmental screening process and prepare an EA Report. The project contact personnel are as follows:

Environmental Assessment Coordinator
Sean Male
Hatch Ltd.
4342 Queen Street, Suite 500
Niagara Falls, ON, L2E 7J7

Tel: 905-374-0701, ext 5280
Fax: 905-374-1157
Email: smale@hatch.ca

1.2.2 Federal Involvement

1.2.2.1 Financial Support

No federal funding is being sought for the construction of the Project. When completed, the Project will be eligible for federal funding under the NRCan ecoENERGY for Renewable Power Program, which is based on power production, i.e., the incentive will be paid per unit (kWh) of energy produced. A submission has been made to NRCan by Saturn.

The NRCan contact information is as follows:

ecoENERGY for Renewable Power
Renewable and Electrical Energy Division
Natural Resources Canada
615 Booth, Room 160
Ottawa, ON, K1A 0E9

Tel: 1-877-722-6600
Fax: 613-995-8343
Email: ecoenergyrp@nrcan.gc.ca

1.2.3 Authorizations Required

Table 6.1 in Section 6 lists the applicable main permits and approvals that may be required for development of the site. Permit and approval requirements may change depending on amendments to regulations.

1.3 Project Information

1.3.1 Project Components/Structures

The project will involve the following major components:

- installation of a road network on the optioned lands to access and build the tower foundations and erect the wind turbine generators
- installation and operation of five 2-MW WTGs within the municipality of Chatham-Kent
- installation of underground cable for electrical turbine interconnection
- construction of a 27.6-kV overhead line to interconnect the turbines with HONI's 27.6-kV distribution facilities.

Construction of the wind farm will result in the temporary loss of 3 ha and the permanent loss of 1.5 to 2 ha of agricultural land. This permanently lost area would constitute ~0.85% of the total optioned land of 233 ha.

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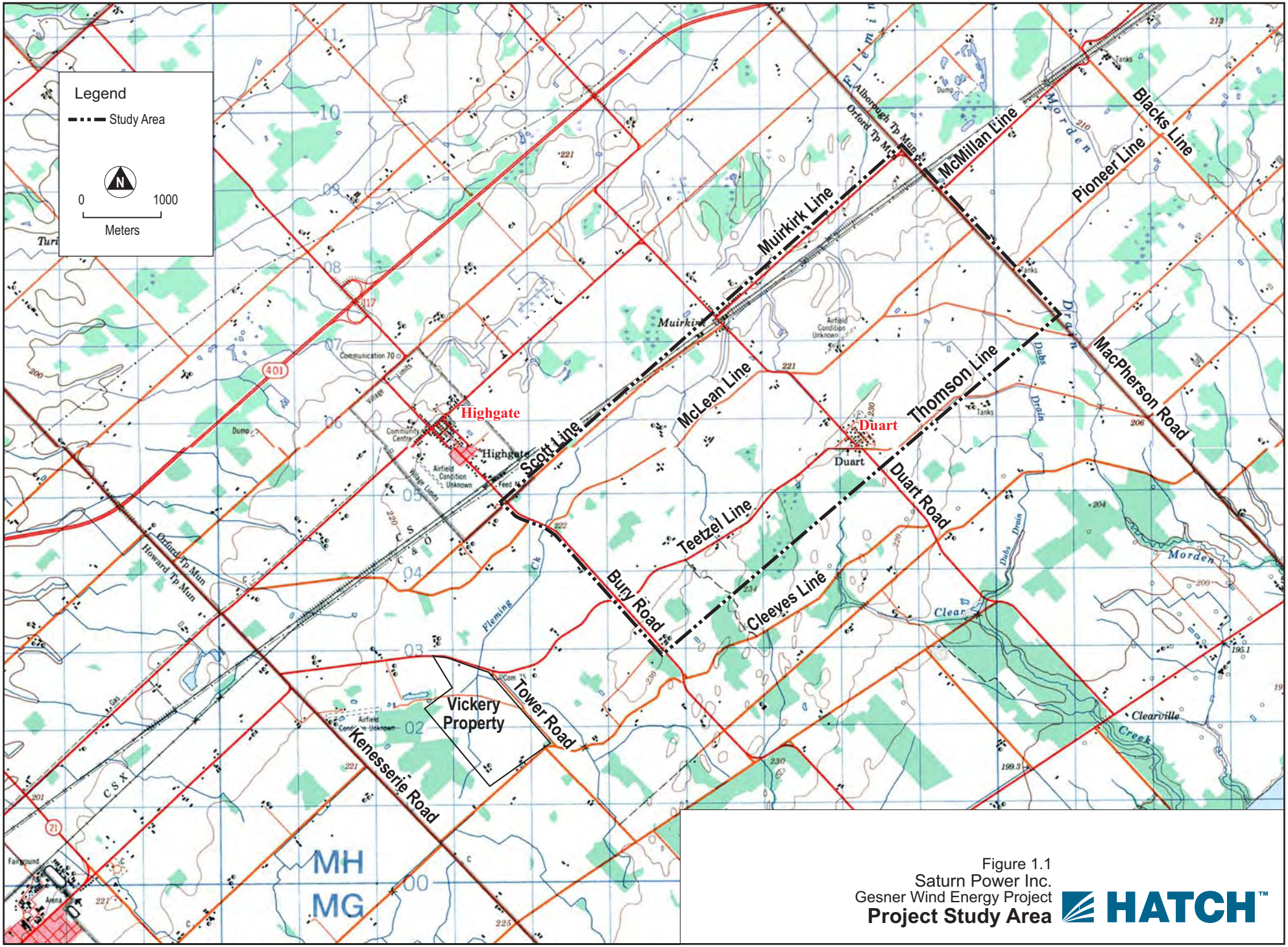

Figure 1.1
Saturn Power Inc.
Gesner Wind Energy Project
Project Study Area

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1.3.2 Wind Turbine Specifications

Specifications on the WTG for the Project are provided in Table 1.3.

Table 1.3 Wind Turbine Specifications

Turbine Make	Gamesa
Turbine Model	G-97 (3 turbines) G-97W (2 turbines)
Name Plate Capacity	2 MW
Hub Height Above Grade	90 m
Rotor Diameter	97 m
Swept Area	7,390 m^2
Rotational Speed – Operation	9.6:17.8 r/min

Information regarding acoustic emissions data is provided in Acoustic Assessment Report prepared for submission to the MOE for Certificate of Approval: Air and Noise. This document is included as Appendix A of this EA report.

1.3.3 Project Activities

The project activities involved in the construction, operation and decommissioning phases of the Project are discussed in Sections 4.1, 4.2 and 4.6, respectively.

1.4 Project Location Information

1.4.1 Project Location

The study area is southeast of the Highgate community within the Municipality of Chatham-Kent and includes the smaller hamlets of Duart and Muirkirk. The study area is bounded in the east by Elgin County and has an area of ~20 km^2 or 2000 ha. The leased land for the Project covers a total area of ~233 ha.

Figure 4.1 illustrates the Project location, showing turbine locations and access roads. The geographic coordinates (UTM NAD 83) of turbines locations are listed below.

Turbine No.	Turbine Type	UTM Northing	UTM Easting
Turbine No. 1	G-97	4708431 m N,	438829 m E
Turbine No. 2	G-97	4707719 m N,	437817 m E
Turbine No. 3	G-97W	4707807 m N,	439471 m E
Turbine No. 4	G-97W	4706936 m N,	439609 m E
Turbine No. 5	G-97W	4708136 m N,	438472 m E

As is noted in Section 1.3.1, upgrades to the existing distribution network may be required for the Project, however this is not considered part of the Project as work will ultimately be completed by Hydro One Networks Inc. (HONI), who will also retain ownership of the distribution line. As a result, any work required will be completed as part of HONI's approval process.

There is no laydown area required for the Project, materials will be delivered to site as they are ready for use.

2 Scope of the Environmental Assessment

2. Scope of the Environmental Assessment

This report is intended to satisfy the requirements of Section V.0.1 of the Ontario Environmental Protection Act (EPA) requiring that renewable energy projects obtain a REA from the MOE. The requirements for obtaining the REA are provided in Ontario Regulation 359/09 (Renewable Energy Approvals Under Part V.0.1 of the EPA).

Table 1 provided in O.Reg. 359/09 identifies supporting documents requiring submission as part of an application for a REA. According to Table 1, the following documentation is to be prepared and submitted for a Class 3 wind facility.

- Construction Plan Report (including details of construction activities, potential negative environmental effects and mitigation measures)
- Consultation Report [including an outline of results of consultation with public, municipalities and Aboriginal communities and two Public Information Centres (PICs)]
- Decommissioning Plan Report (including a description of plans for decommissioning of the Project)
- Design and Operations Report (including plans, specifications, description of the Project, details of the environmental monitoring plans and response plans for the Project)
- Natural Heritage Assessment Report, where required, which is dependent on proximity to natural heritage features (including records review, site investigation, evaluation of significance, and environmental impact study, where required)
- Archaeological and Heritage Assessment Report, if applicable
- Noise Study Report [report to be prepared in accordance with Appendix A of the MOE "Basic Comprehensive Certificates of Approval (Air) – User Guide", April 2004]
- Project Description Report.

This EA report is intended to satisfy the requirements of the above-noted reports. See Appendix B for a copy of Table 1 and the corresponding section of this EA report where each requirement is satisfied; a summary of this table is provided in Table 1.

Environmental components examined in the assessment process covered both the natural and social environments. These are listed in Table 2.1.

Table 2.1 Environmental Components

Environmental Components	
Natural Environment	• Physiography/Topography • Soils • Aggregate Resources • Surface Water • Groundwater • Wetlands • Valleylands • Vegetation, including woodlands • Birds and Bird Habitat • Bats and Bat Habitat • Other Wildlife and Wildlife Habitat • Parks and Significant Natural Areas • Air Quality
Social Environment	• Employment and Local Benefit • Agricultural Land Use • Tourism and Recreation • Cultural Heritage Resources • Property Values • Sound Levels • Visual Landscape • Community Safety • Local Traffic • Effects to Radiocommunication Systems • Waste Management and Disposal Sites

2.1 Methodology of Environmental Screening

The following steps outline the methodology for the environmental assessment:

1. Identification of the temporal and spatial boundaries based on the Project-environment interactions and therefore the potential to affect the environmental components.

2. Background data collection, identification of data gaps and the design and implementation of baseline studies to fill data gaps on the natural and social features and conditions of the study area.

   Data was collected from the following sources:

   - field investigations
   - local government agencies
   - input from the local community
   - published sources (e.g., MNR Natural Heritage Information Centre)

3. Consideration of public, First Nations and agency issues and comments as a result of consultation.

4. Identification of the effects that are likely to occur on the environmental components as a result of implementing the Project based on information obtained on the existing conditions.

5. Determination of the likely environmental effects from malfunctions and accidents (such as spills and fires).
6. Identification of the effects of the environment on the project (such as flooding and severe weather).
7. Development of mitigation measures to eliminate, alleviate or avoid the adverse effects where possible.
8. Determination of any adverse residual effects and their significance.
9. Determining the likelihood of any significant adverse environmental affects.
10. Design of a monitoring and follow-up program to assess predicted effects and the effectiveness of mitigation measures.

3 Existing Environment

3. Existing Environment

The following sections describe the existing natural environment and social conditions of the study area. The study area (extending between Muirkirk and Scotts Lines in the north, MacPherson Road in the east, south of Cleeves Line in the south, and Bury Road in the west) is shown in Figures 3.1 and 3.2 within the regional and local environmental context.

3.1 Geophysical Environment

3.1.1 Physiography and Topography

The study area for the Project is situated in a predominantly flat area located approximately 10 km inland from the northwestern shore of Lake Erie. The physiography of the region is the result of the latest glacial event, i.e., the Wisconsinan glaciation. The study area lies primarily within till moraines of the Blenheim moraine, with the exception of the southeastern portion which lies in sand plains. The Blenheim moraine is considered to be unusually wide, at approximately 11 km across at one point. A shorecliff and associated beaches from glacial Lakes Warren and Whittlesey also cross the southeastern portion of the study area at the edge of the Blenheim moraine, representing the transition from the till moraines to the sand plains (Ontario Department of Mines and Northern Affairs, 1972; Cooper and Baker, 1978; Chapman and Putnam, 1984).

Ground elevations in the study area rises from a local low of approximately 206 m above sea level (asl) in the southeastern corner of the study area, rising to a maximum elevation of 234 m asl around Duart before gradually declining again to 220 m asl (corresponding to a shorecliff of glacial Lake Whittlesey) to the west near Highgate. Relief is gradual in the majority of the study area, with the most rapid change in elevation occurring in the southeast corner, where 25 m of relief occurs over 2 km in association with the previously described shorecliff and beaches (Cooper and Baker, 1978; Department of Energy, Mines and Resources, 1995a,b).

3.1.2 Surficial Geology and Aggregate Resources

Surficial deposits found in the vicinity of the study area include sandy silt to silt matrix tills (Tavistock and Catfish Creek), as well as glaciolacustrine deposits (including sand, gravelly sand and gravel, and silt and clay/minor sand) (Barnett et al., 1991). Surficial deposits in the Project location consist mainly of sand and gravelly sand to a depth of approximately 5 m beyond which it changes to a firm clay. Drift thickness within the study area varies from approximately 53 m in the northwest corner to 88 m in the southeast corner of the study area (Cooper and Nicks, 1981a,b). Prior to construction, site-specific characteristics will be confirmed through geotechnical investigations.

A zone of medium potential for aggregate resources is known to occur within the study area (Municipality of Chatham-Kent, 2007); 1 of the 5 turbines proposed for the Project is located inside this zone.

3.1.3 Bedrock Geology

Bedrock of the study area consists primarily of Upper Devonian shale from the Kettle Point Formation, with the southeastern portion of the study area underlain by Middle Devonian limestone, dolostone, and shale of the Hamilton Group. These two groups are separated by a fault that is

traceable on the surface (Ontario Geological Survey, 1991). The bedrock surface of the Kettle Point Formation within the study area varies from 150 to 165 m asl, while that of the Hamilton Group in the southeastern portion of the study area is 120 m asl (Cooper, 1978a,b).

3.1.4 Petroleum Resources

The Ontario Oil, Gas and Salt Wells Resources Library was consulted to determine if there are any oil pools or oil wells within the study area. A query of the Petroleum Well map identified no wells or pools knows to be active, or abandoned, within the study area (Oil, Gas and Salt Resources Corporation, 2009).

3.1.5 Seismicity

There are no historic records (1600 to 2006) of any significant earthquakes (magnitude 6 or higher on the Richter scale) recorded within this portion of the province, and no earthquakes have been recorded within close proximity of the study area (NRCan, 2008a). As with most of southern Ontario, several smaller earthquakes (magnitude <2.5 on the Richter scale) have been recorded within the region (Southern Ontario Seismic Network, 2008), however the nearest earthquake to the study area above this level was a magnitude 3 (on the Richter scale) earthquake (date unknown), with the epicenter focused 50 km northeast of the study area, near St. Thomas, ON (NRCan, 2008b). The National Earthquake database, which maintains records of earthquakes since 1985, was queried for all seismic events with magnitudes >2.5 (on the Richter scale) that have occurred within a 100 km radius of 24.515°N latitude and 81.773°W longitude (approximately the location of Muirkirk, near the middle of the study area). Twenty-nine events (locations shown in Figure 3.3) have been recorded within 100 km of the study area, with only eight of those greater than magnitude 3 on the Richter scale (Table 3.1).

These events would produce motions that might be weakly felt within the study area, but are below the threshold at which light objects would move.

The Ontario Building Code specifies that new structures be designed to withstand lateral force at the base of a structure equivalent to a potential seismic event. The study area is located in a region of low seismic activity with peak ground accelerations in the order of 0.130 to 0.138 times the acceleration due to gravity ($g = 9.8$ m/s), at a probability of 2%/50 years for firm ground conditions (NRCan, 2005; National Research Council, 2005). Detailed engineering design will ensure that all conditions of the Ontario Building Code are satisfied.

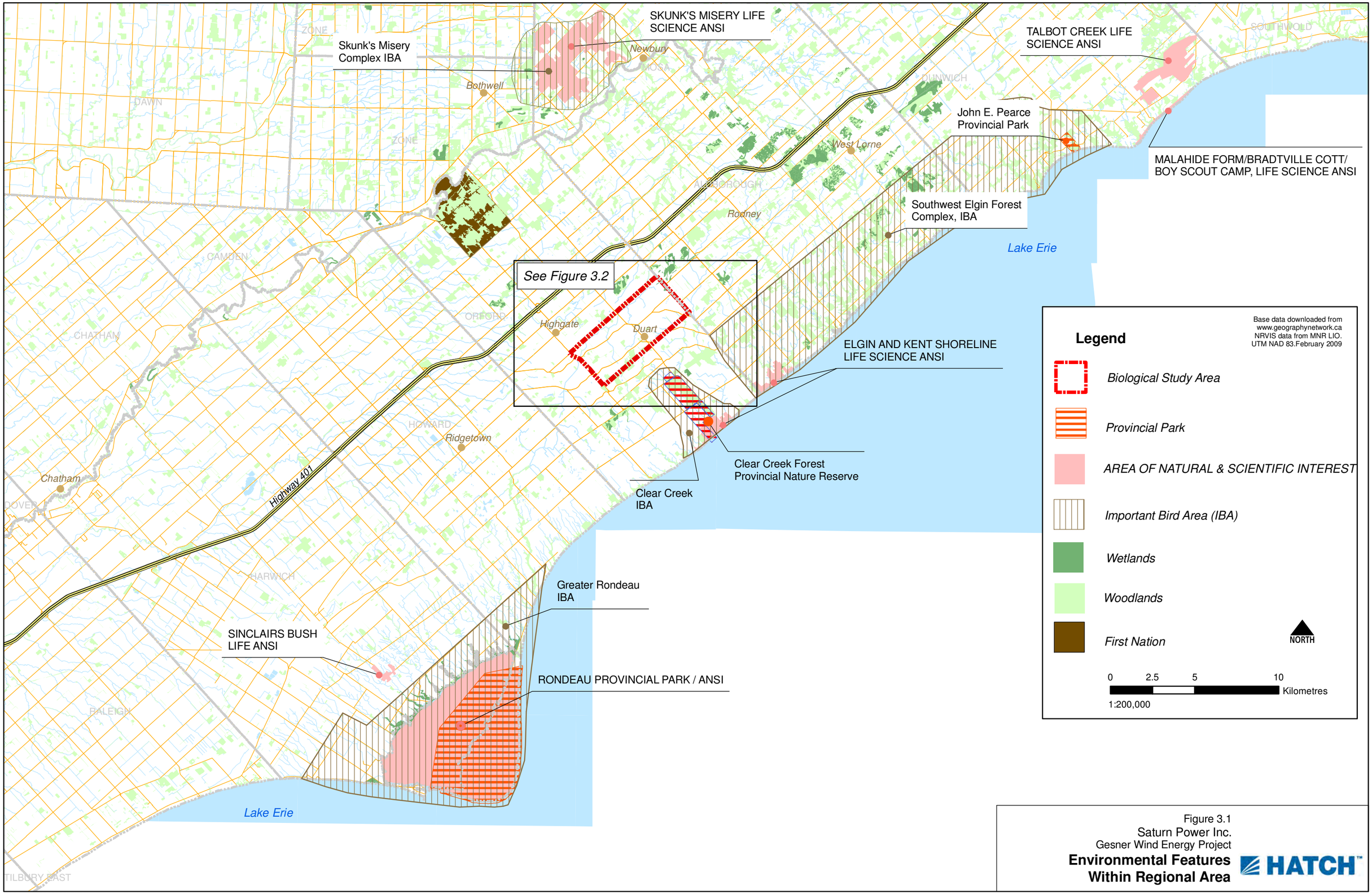

Figure 3.1
Saturn Power Inc.
Gesner Wind Energy Project
Environmental Features Within Regional Area

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Beault Locally Significant Wetland

Taylor Pond, Life Science Site/
Provincially Significant Wetland

South Rodney Woods, Life Science
Site/ Provincially Significant Wetland

Highway 401

Muirkirk Line

TOWNSHIP
OF ORFORD

WEST ELGIN

Muirkirk

MacPherson Road

Morden Drain

Duart

Highgate

Scott Line

Duart Road

Bury Road

Dubs Drain

Highgate Rail Road Praire West,
Life Science Site

Fleming Creek

Clear Creek

Wayne Smith's Woodlot
Provincially Siginificant Wetland

Duart Rolling Sandland,
Life Science Site

Clear Creek IBA

Clear Creek Regional
Significant ANSI

Legend

- Natural Area
- Biological Study Area
- Building
- Wetlands
- Provincial Nature Reserve
- Deer Wintering Area
- Woodland
- Important Bird Area (IBA)

Base data downloaded from
www.geographynetwork.ca
NRVIS data from MNR LIO.
UTM NAD 83.December 2009

0 0.25 0.5 1 Kilometres

1:35,000

NORTH

Figure 3.2
Saturn Power Inc.
Gesner Wind Energy Project
Environmental Features Within Local Area

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Table 3.1 Earthquakes of Magnitude >2.5 within 100 km of the Study Area Since 1985 (NRCan, 2009)

Date	Latitude	Longitude	Magnitude (Richter Scale)	Location or Comment
2008/09/20	41.72	-81.42	2.5	South shore Lake Erie
2008/09/18	41.80	-81.42	2.9	Lake Erie
2008/01/09	41.74	-81.42	3.5	South shore Lake Erie
2007/10/18	41.73	-82.22	2.7	Lake Erie
2007/10/17	41.79	-81.42	3.4	South shore Lake Erie
2007/10/16	41.74	-81.42	2.5	South shore Lake Erie. Foreshock
2006/06/20	41.85	-81.22	3.7	South shore Lake Erie
2006/03/11	41.82	-81.42	3.1	South shore Lake Erie. Felt
2006/02/10	41.75	-81.40	2.6	South shore Lake Erie
2006/01/13	41.69	-81.40	2.5	South shore Lake Erie. Felt
2006/01/06	41.80	-81.38	2.8	South shore Lake Erie
2005/02/01	41.82	-81.11	2.5	Southern Lake Erie
2004/06/30	41.84	-81.19	3.3	Ohio
2003/06/30	41.80	-81.27	3.6	South shore Lake Erie. Felt
2002/04/28	41.92	-81.46	2.6	Ohio
1999/09/22	41.83	-81.48	2.8	Ohio
1999/01/27	42.31	-82.31	2.5	South Ontario. Felt
1999/01/27	42.33	-82.30	2.6	South Ontario. Felt
1998/03/14	42.13	-82.48	2.6	Southwestern Ontario
1998/01/27	42.03	-80.99	3.0	Lake Erie
1995/12/30	42.85	-82.31	2.7	Southern Ontario
1993/11/01	42.69	-81.17	2.8	10 km S from St. Thomas
1992/03/31	42.01	-80.79	2.8	86 km S from Aylmer
1992/03/26	42.11	-80.85	2.9	Lake Erie
1992/03/15	41.81	-81.22	2.5	102 km SE of Chatham
1992/03/15	41.81	-81.22	3.7	102 km SE of Chatham
1988/12/25	41.83	-81.03	2.5	Painesville
1988/06/27	41.84	-81.11	2.7	South shore Lake Erie
1985/07/11	42.36	-80.75	2.6	49 km SE from Aylmer

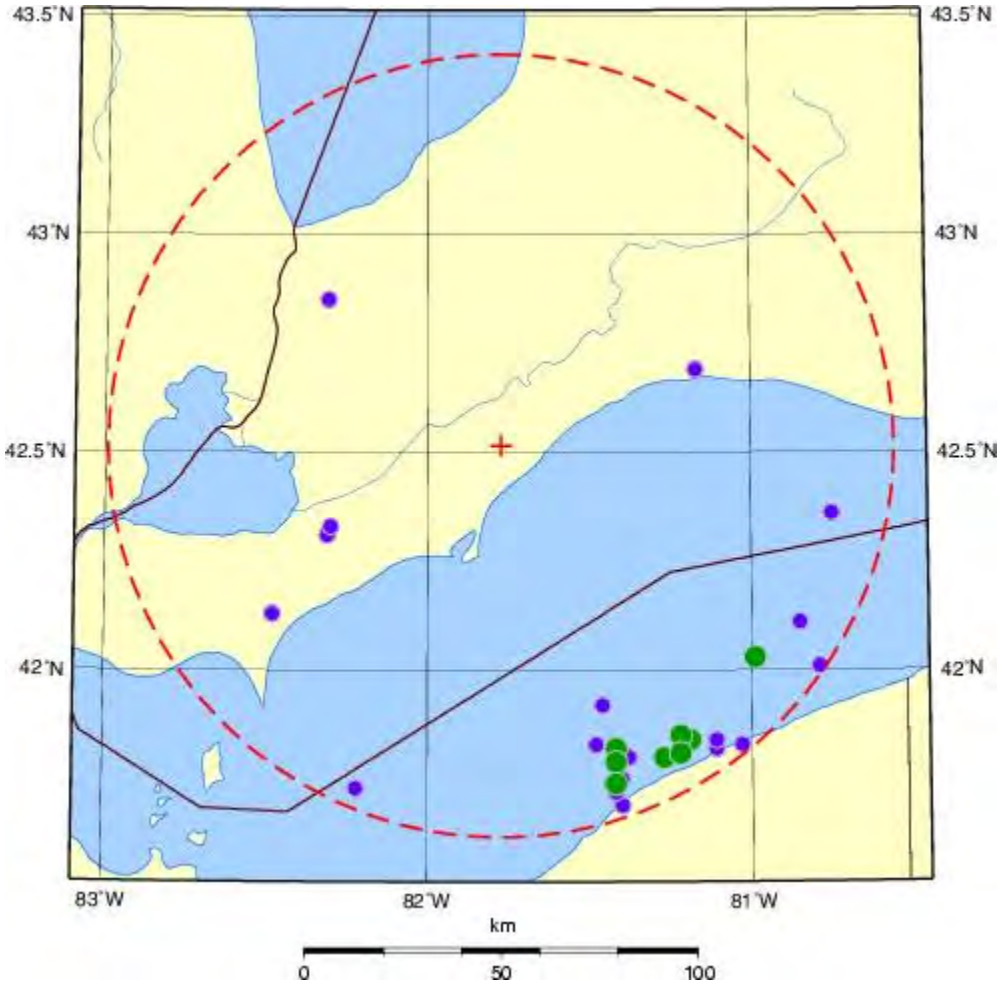

Figure 3.3 Locations of Earthquakes Since 1985 within 100 km of the Study Area with Magnitudes Greater than 2.5 (Reproduced from NRCan, 2009)

Red cross is centered within study area at 42.515°N and 81.773°W, approximately midpoint of study area; blue circles are events with magnitude ≥2.5; green circles are events with magnitude ≥3.

3.1.6 Hydrogeology/Groundwater

No significant groundwater resources are known to occur within the study area. Groundwater flow mimics the topography of the area and, thus local groundwater will flow from the highest zones of elevation in the area, around Duart, toward Dubs or Morden Drains in the southeast, and toward Fleming Creek in the north. The depth of the groundwater table is likely to vary significantly within the study area. Depending on the season and localized soil/rock permeability conditions, the ground in the Project location may be dry to saturated. Prior to construction, site specific groundwater conditions are to be determined through further investigation (e.g., core sampling at specific locations).

Groundwater within the study area is likely the primary water supply, through a well, for the majority of residences within the study area.

3.2 Waterbodies and Hazard Lands

The following sections document the existing aquatic environment (waterbody) features currently found on the site. This section summarizes information collected during the records review and site investigation. Records that were reviewed are identified below, with sections where interpretation of the data collected can be found.

There are no planning boards, municipal planning authorities, local roads boards or local services boards within the jurisdiction of the Project site. Also, the Project site is not located within the Niagara Escarpment Commission Plan Area. Therefore, records review for these governing bodies was not conducted.

Table 3.2 Water Body Records Reviewed

Organization	Individual Contacted/ Information Source	Records Searched	Relevant Report Sections
Federal Government			
Fisheries and Oceans Canada	Distribution of Fish Species at Risk (DFO, 2010)	Distribution of Fish Species at Risk within the Lower Thames Valley Conservation Authority.	Section 3.2.1
Provincial Government			
Ministry of Natural Resources	Land Information Ontario	Ontario Base Maps were reviewed for waterbodies within 120 m of the Project location.	Section 3.2.1
Conservation Authority			
Lower Thames Valley Conservation Authority	Lower Thames Valley Conservation Authority Website	Website was reviewed for any information relating to waterbodies. No additional information was found.	n/a
	Valerie Towsley, Resource Planner	Valerie Towsley was contacted in order to discuss Peet's Drain, which will be crossed as part of the Project. Information relating to the drain classification was provided.	Section 3.2.1
Municipality			
Municipality of Chatham-Kent	Official Plan	The official plan of the Municipality of Chatham-Kent was reviewed for information relating to water bodies. No additional information was found from	Section 3.2.1

Organization	Individual Contacted/ Information Source	Records Searched	Relevant Report Sections
		that identified through LIO records.	
Municipality of West Elgin	Official Plan	The official plan of the Municipality of West Elgin was reviewed for information relating to water bodies. No additional information was found from that identified through LIO records.	Section 3.2.1

3.2.1 Water Body Features

The southern portion of the study area is located within the Clear Creek watershed, consisting of a network of unnamed drains flowing into Dubs Drain and eventually into Clear Creek, which is a tributary of Lake Erie. The northern section of the study area is situated within the Fleming Creek watershed. There are a number of drains flowing into Fleming Creek, which ultimately flows into the lower Thames River (see Figure 3.2). None of the watercourses within the study area are known to contain aquatic species at risk (DFO, 2010).

There are two drains (Peets Drain and Jenson Drain) located within 120 m of Project components (see Figure 3.2). Two site investigations were undertaken. The first, on May 11, 2010 was to assess the aquatic habitat features of the Peets Drain. The site investigation started at 10:00 a.m. and lasted for 6 hours. Weather conditions during the site investigation were overcast, with light to moderate precipitation. The second, on May 5, 2011, to assess the aquatic habitat features of the Jenson Drain. The site investigation started at 9:00 a.m. and lasted for 1 hour. Weather conditions during the site investigation were clear. The first site investigation was completed by Caleb Coughlin, while the second was completed by Levi Snook. Their qualifications are provided in Appendix C.

The Peets Drain is an open municipal drain, which eventually flows into Fleming Creek via the Fleming Creek Drain. In the vicinity of the Project location, the drain has a bank full width of 5 m narrowing to 1 m at the base. The form and function of the channelized drain are consistent with those found in agricultural areas in southern Ontario. The riparian vegetation community surrounding the channel is dominated by grasses and sedges, with burdock, sow thistle, and wild cucumber present (see Figure 3.4). Riparian vegetation extends approximately 2 m from the top of bank, at which point cultivated lands begin. Fish habitat of the Peets Drain is classified by the Lower Thames River Conservation Authority as a Type C Drain, which is a permanent, warmwater water body with no sensitive species and/or communities present (OMAFRA, 2010). The site investigation on May 11, 2010 confirmed that fish habitat of the drain consists of a warm water stream with depths ranging from 5 to 30 cm, with emergent sedges present throughout the channel. No fish were observed within the drain, though visibility was poor at the time of the site investigation due to heavy rains in the area.

Figure 3.4 Peets Drain in the Vicinity of the Project Location

The Jenson Drain is an open municipal drain, which eventually flows into Clear Creek via Dubs Drain. The drain originates in a field west of the Project location and flows south past the access road to WTG4. Aquatic habitat during the site investigation consisted of a small, relatively homogeneous channel, with few pools or wider areas. Average depth during the site investigation was 10 cm with a width of 40 cm. At the time of the site investigation, the drain had been recently cleaned out and there was no instream, and scattered bank vegetation present. To the west of the drain, there is about 1 m of riparian vegetation similar in composition to that surrounding Peet's Drain, i.e., dominated by grasses and sedges, with burdock, sow thistle, and wild cucumber present. To the east of the drain, there are several metres of grasses and common invasive species extending from the top of bank to a hedgerow community, with cultivate field on the opposite side of the hedgerow. The Jenson Drain is classified as a Type F drain, which is an intermittent or ephemeral feature (OMAFRA, 2010). No fish were observed within the drain at the time of the site investigation.

Based on the results of the site investigation, information on locations of waterbodies within 120 m of the Project location was accurate, and no additional water bodies were identified during the site investigation. There are no corrections to the Records Review are required as a result of the Site Investigations.

Figure 3.5 Jenson Drain in the Vicinity of the Project Location

3.2.2 Hazard Lands

There are no hazard lands identified within the study area (Municipality of Chatham-Kent, 2009). Observations during site visits noted no areas of potential hazard lands within 120 m of project components.

3.2.3 Tile Drainage

Drainage tile has been installed on all of the fields that comprise the leased lands (shown in Figure 1.1); tiles drain toward existing surface water features and municipal drains present within the area.

3.3 Natural Heritage/Terrestrial Environment

Note: A separate Natural Heritage Assessment Report and Environmental Impact Study (NHA/EIS) was prepared and obtained confirmation from the Ministry of Natural Resources. The NHA/EIS is provided within Appendix H of this Report. Information presented within Sections 3.3 and 4.3 provides a summary of what is contained within the NHA/EIS, as well as additional information not required under the Renewable Energy Approval Process.

The following sections document the existing natural heritage/terrestrial environment features currently found on the site. Records that were reviewed are identified below, with sections where interpretation of the data collected can be found.

Table 3.3 Natural Heritage Records Reviewed

Organization	Individual Contacted/ Information Source	Records Searched
Federal Government		
Natural Resources Canada	Amphibians and Reptiles of Ontario (McKenney et al. 2007)	Climate domain maps of amphibians and reptiles within the province of Ontario.
Government of Canada	Species at Risk Registry Geographic Query	The geographic query was used to determine what federal species at risk may be found within the Project site.
Provincial Government		
Ministry of Natural Resources	Land Information Ontario	Ontario Base Maps were reviewed for natural features in the vicinity of the Project site, including woodlots, wetlands, and stick nests/deer wintering areas
	Natural Heritage Information Centre (NHIC, 2008 a and b)	The NHIC geographic query tool and species search tool were used to identify known occurrences of species at risk or other natural features (such as Areas of Natural and Scientific Interest and significant wetlands
Conservation Authority		
Lower Thames Valley Conservation Authority	Lower Thames Valley Conservation Authority Website	Website was reviewed for any information relating to natural features. No additional information was found
Municipality		
Municipality of Chatham-Kent	Official Plan	The official plan of the Municipality of Chatham-Kent was reviewed for information relating to natural features.
Municipality of West Elgin	Official Plan	The official plan of the Municipality of West Elgin was reviewed for information relating to natural features. No additional information was found.

Organization	Individual Contacted/ Information Source	Records Searched
Other Sources of information		
Ontario Breeding Bird Atlas	Results of the 2001-2005 Breeding Bird Atlas	Atlas results were reviewed to provide background information on bird populations in the area.
Atlas of the Mammals of Ontario	Atlas records	The atlas was reviewed for information on mammals that may be found within the study area
Important Bird Areas of Canada	Important Bird Areas of Canada Website	The website was reviewed for information relating to important bird areas in the vicinity of the study area.

Dates, start times, and durations of all site investigations associated with natural heritage features/terrestrial environment are provided in the table below.

All site investigations were conducted by Sean Male, with the exception of the visits on May 11, 2010 and April 27, 2011, which were conducted by Caleb Coughlin, and the visit on May 5, 2011, which was conducted by Levi Snook and Melissa Gibson. Qualifications for these individuals are provided in Appendix C.

Weather conditions at the time of all site investigations are provided in Appendix C associated with the results of the individual surveys. Field Data can be found in Appendix G.

Table 3.4 Dates, Start Times and Durations of Natural Heritage/ Terrestrial Environment Site Investigations

Date (mm/dd/yy)	Start Time	Duration (hours)	Focus of Site Investigation
02/07/08	09:59	6	Over-winter Birds, Wildlife Habitat
02/28/08	08:05	8	Over-winter Birds, Wildlife Habitat
03/12/08	08:30	7	Over-winter Birds, Wildlife Habitat
04/02/08	07:25	8	Spring Birds, Wildlife Habitat
04/24/08	06:18	10.5	Spring Birds, Wildlife Habitat
05/13/08	05:59	11	Spring Birds, Wildlife Habitat
06/10/08	19:28	3	Summer Birds
06/11/08	05:19	10	Summer Birds, Wildlife Habitat, Woodlands, Valleylands, Wetlands
06/11/08	20:15	2	Summer Birds
06/12/08	05:24	7.5	Summer Birds, Wildlife Habitat, Woodlands, Valleylands, Wetlands
06/24/08	05:13	8	Summer Birds, Wildlife Habitat, Woodlands, Valleylands, Wetlands
06/24/08	19:06	3.5	Summer Birds
06/25/08	05:09	9.5	Summer Birds, Wildlife Habitat, Woodlands, Valleylands, Wetlands
06/25/08	19:16	3.5	Summer Birds
08/02/08	20:40	10.5	Bats, Wildlife Habitat
08/03/08	20:40	9.5	Bats, Wildlife Habitat

Date (mm/dd/yy)	Start Time	Duration (hours)	Focus of Site Investigation
08/05/08	20:26	10.5	Bats, Wildlife Habitat
08/06/08	20:35	10	Bats, Wildlife Habitat
08/07/08	20:52	10	Bats, Wildlife Habitat
08/08/08	20:14	10.5	Bats, Wildlife Habitat
08/09/08	22:50	2	Bats, Wildlife Habitat
08/10/08	20:52	10	Bats, Wildlife Habitat
08/11/08	20:38	10	Bats, Wildlife Habitat
08/12/08	20:32	10	Bats, Wildlife Habitat
08/13/08	20:30	10	Bats, Wildlife Habitat
08/14/08	20:19	10.5	Bats, Wildlife Habitat
08/15/08	20:33	10	Bats, Wildlife Habitat
08/18/08	20:28	10	Bats, Wildlife Habitat
08/19/08	14:00	4	Fall Birds, Wildlife Habitat
08/19/08	20:33	10	Bats, Wildlife Habitat
08/20/08	06:11	10	Fall Birds, Wildlife Habitat
08/20/08	20:29	10	Bats, Wildlife Habitat
08/21/08	20:10	10.5	Bats, Wildlife Habitat
08/25/08	20:40	10	Bats, Wildlife Habitat
08/26/08	20:18	10.5	Bats, Wildlife Habitat
08/27/08	20:29	3.5	Bats, Wildlife Habitat
08/28/08	20:29	10.5	Bats, Wildlife Habitat
08/29/08	20:27	10.5	Bats, Wildlife Habitat
09/03/08	10:30	6.5	Fall Birds, Wildlife Habitat
09/03/08	20:01	11	Bats, Wildlife Habitat
09/04/08	06:00	4.5	Fall Birds, Wildlife Habitat
09/07/08	20:08	11	Bats, Wildlife Habitat
09/09/08	19:58	11	Bats, Wildlife Habitat
10/02/08	06:50	11	Fall Birds, Wildlife Habitat
10/30/08	07:30	10	Fall Birds, Wildlife Habitat
05/11/10	10:00	6	Wildlife Habitat
04/27/11	12:45	4	Wildlife Habitat, Wetland
05/05/11	10:00	0.5	Wildlife Habitat
05/11/11	13:54	0.5	Wildlife Habitat

3.3.1 Vegetation, Including Woodlands

The Gesner study area occurs within the Niagara Section of the Deciduous Forest Region, which encompasses the main body of the Ontario peninsula. Local climatic and soil conditions have enabled range extensions of more southerly deciduous species into this portion of the province. Local forests are dominated by broadleaved trees, with beech *(Fagus grandifolia*) and sugar maple (*Acer saccharum*) dominant together with basswood (*Tilia americana*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white oak (*Quercus alba*), and bur oak (*Quercus macrocarpa*) (Rowe, 1972). The majority of the area, including that of the study area, has been settled, with forest communities restricted to small farm woodlots, hedgerows, and remnant stands on land not suitable for farming. Several small woodlots, dominated by the deciduous species described above occur scattered across the study area (see Figure 3.2), with the remaining trees in the study area restricted to hedgerows, ornamental plantings, and scattered single occurrences within fields. Other species observed in the

area include weeping willow (*Salix alba*), black walnut (*Juglans nigra*), shagbark hickory (*Carya ovata*), and bitternut hickory (*Carya cordiformis*).

The majority of the study area is encompassed by agricultural lands, with common crops being hay, soy, and corn. Bordering the fields and along roadsides in the area, communities are dominated by common weedy species, such as grasses, dandelion (*Taraxacum officinale*), sow thistle (*Sonchus arvensis*), hawkweed (*Hieracium aurantiacum*), ox eye daisy (*Chrysanthemum leucanthemum*), and wild carrot (*Daucus carota*).

There are no rare vegetation communities or significant woodlands identified within the Project location, though these communities do exist within the regional area (see Section 3.3.5). As shown in Figure 4.1. The Records Review identified a woodland present within 120 m of WTG 4 and the associated access road. This feature was investigated thoroughly during the site investigations in 2011 and it was determined to not meet the definition of woodland present in the pre-2011 REA Regulation, and was more consistent with a hedgerow community (i.e., feature consists of a single to maximum double row of trees to a maximum width of 25 m (from crown edge to crown edge). As such, the feature does not meet the definition of a woodland. Therefore, there are no woodlands present on or within 120 m of the Project location.

There are several other hedgerows present within 120 m of the Project location. None of these features meet the definition of a woodland; however, they are considered in terms of significant wildlife habitat features in Section 3.3.3.1.

Several vulnerable/threatened/endangered (VTE) species of vegetation have been reported from the study area (see Table 3.2). Three of these species, American chestnut (*Castanea dentata*), dense blazing star (*Liatris spicata*) and willowleaf aster (*Symphyotrichum praealtum*), are considered to be species at risk (discussed further in Section 3.3.4.1). None have been observed within the Project location, however, prior to construction potentially impacted areas will be searched for VTE vegetation species.

3.3.2 Wetlands and Valleylands

There are no valleylands identified on or within 120 m of the Project location.

Records identified small areas of wetland near WTG3 and the associated access road, however the site investigation determined that there are no wetland communities on or within 120 m of the Project location. In the southeastern portion of the study area, two small treed vernal pools (see Figure 3.2) occur within woodlots. The presence of water within these features is ephemeral, with the substrate dry by the middle of the summer. These wetland communities are all located more than 120 m from the Project location, and therefore an evaluation of significance or environmental impact study is not required. Ponding on agricultural fields is also common in the spring given the clay-based nature of the soils. However, the drainage systems in place prevent development of wetland communities in these areas as habitats dry out as the summer progresses.

Outside of the study area, three provincially significant wetlands are known to occur nearby (see Section 3.3.5, or Figure 3.2). These wetlands are all located at least 120 m away from any portion of the development.

Table 3.5 VTE Species of Vegetation[1]

Species		Conservation Status[2]					
		Ontario			Canada		
		SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]
Castanea dentata	American Chestnut	S2	END	END	N3	END	END
Cyperus erythrorhizos	Red-root Flatsedge	S3	--	--	N3	--	--
Liatris spicata	Dense Blazing Star	S2	THR	THR	N3	THR	THR
Sporobolus asper	Longleaf Dropseed	S1S2?	--	--	N?	--	--
Symphyotrichum praealtum	Willowleaf Aster	S2	THR	THR	N2	THR	THR

[1] Based on those observations within the study area as viewed on NHIC, 2008a
[2] Accessed from NHIC, 2008b, MNR, 2008, and Government of Canada, 2008a.
[3] SRANK = Provincial Status; S=Sub-national (i.e. Ontario), E = Exotic species; 1 = Critically Imperilled; 2 = Imperilled; 3 = Vulnerable; 4 = Apparently Secure; 5 = Secure; B = Breeding; ZN = Non—breeding migrant/vagrant
[4] COSSARO = Committee on the Status of Species at Risk in Ontario; THR = Threatened, END = Endangered
[5] ESA = Ontario Endangered Species Act, 2007, THR = Threatened (on Schedule 4), END = Endangered (on Schedule 3)
[6] NRANK = National Status (NatureServe (www.natureserve.org), in conjunction with Conservation Data Centres, such as NHIC); N=National Rank (i.e. Canada), 2 = Imperilled, 3 = Vulnerable, ?=Rank Uncertain
[7] COSEWIC = Committee on the Status of Endangered Wildlife in Canada; THR = Threatened, END = Endangered
[8] SARA = Species at Risk Act – Canada; THR = Threatened, END = Endangered (on Schedule 1)

3.3.3 Wildlife

3.3.3.1 Wildlife Habitat

The study area lies within the Ontario Ministry of Natural Resources Ecoregion 7E (Lakes Erie-Ontario), which is also known as the Carolinian Ecoregion. Though this ecoregion represents only 1% of the land area of Canada, its southern latitude and proximity to the moderating influences of the great lakes result in this ecoregion containing a greater number of species of fauna than any other in Canada (Carolinian Canada, 2009).

The Significant Wildlife Habitat Technical Guide (SWHTG) (MNR, 2000) identifies four main types of wildlife habitat that can be classified as significant:

- habitat for seasonal concentrations of animals
- rare or specialized habitats for wildlife
- habitat for species of conservation concern
- wildlife movement corridors.

Each of these types of wildlife habitat is addressed in detail within the NHA/EIS (contained within Appendix H). The determination of the NHA/EIS was that there are no significant wildlife habitat features present on or within 120 m of the Project location.

3.3.3.2 Birds

The study area is located within the Southwest Sub-region of Bird Conservation Region 13 (Lower Great Lakes/St. Lawrence Plain) which corresponds in Ontario to lands south of the Precambrian Shield, and extends into the extreme southern portion of Quebec and the northern states. The avifauna of this region exhibits relatively high species richness during the breeding season on a continental scale, with 168 species of landbirds regularly breeding and wintering in this area, and many other species passing through this while on migration (Ontario Partners In Flight, 2006).

Given that this region is one of the most heavily populated regions within the province, there is a relatively abundant amount of information available from volunteer-based surveys, such as the Ontario Breeding Bird Atlas project (BSC et al., 2006; Cadman et al., 2007). Results from these surveys are discussed with respect to season of use, below. However, this information is available for a large area, and the level of effort across areas is not standardized.

In order to increase the level of understanding with respect to bird populations and bird use of the study area, a baseline investigation program was developed using existing provincial and federal guidance documents:

- Environment Canada (EC) and Canadian Wildlife Service (CWS) – Wind Turbines and Birds – A Guidance Document for Environmental Assessment (EC and CWS, 2007a)
- EC and CWS – Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (EC and CWS, 2007b)
- Ontario Ministry of Natural Resources (MNR) – Guideline to Assist in the Review of Wind Power Proposals – Potential Impacts to Birds and Bird Habitats (MNR, 2007a).

Based on the EC and CWS guidance document for environmental assessment, level of effort for baseline investigations is determined by the level of concern. The study area of the Gesner Wind Power Development is considered to be a category 2 level of concern as

- the facility size is "small" [total local area (Project location plus surrounding 1 km) projected to contain 1 to 10 turbines]
- the site sensitivity is "high" as a result of
  - site contains birds known to have aerial flight displays - i.e., Horned Lark (*Eremophila alpestris*)
  - site contains Ontario Partners In Flight Priority Species for BCR Region 13 (see Table 3.6)
  - site is close to significant migration staging or wintering area for waterfowl or shorebirds (i.e., the Rondeau Provincial Park Important Bird Area which encompasses the wetlands and adjoining fields of Rondeau Provincial Park located approximately 17 km south-southwest of the study area).

Table 3.6 Priority Bird Species of Ontario Bird Conservation Region 13 (Ontario Partners in Flight, 2005) that may Potentially Occur within the Study Area

• Northern Harrier	• Bald Eagle	• American Kestrel
• Black-billed Cuckoo	• Whip-poor-will	• Belted Kingfisher
• Red-headed Woodpecker	• Northern Flicker	• Eastern Wood-pewee
• Willow Flycatcher	• Eastern Kingbird	• Bank Swallow
• Wood Thrush	• Blue-winged Warbler	• Golden-winged Warbler
• Cerulean Warbler	• Prothonotary Warbler	• Prairie Warbler
• Canada Warbler	• Yellow-breasted Chat	• Rose-breasted Grosbeak
• Eastern Towhee	• Field Sparrow	• Vesper Sparrow
• Savannah Sparrow	• Eastern Meadowlark	• Bobolink
	• Baltimore Oriole	

Projects in a category 2 level of concern require "basic surveys spread over a 1-yr period, to obtain quantitative information on birds using the site and to identify any potential mitigation measures to minimize damage to bird habitat during construction." (EC and CWS, 2007a).

Monitoring programs, outlined below by season, were conducted to satisfy this level of concern. A copy of the program, which was submitted to EC and MNR in 2008, is appended to this report (see Appendix C).

3.3.3.2.1 Summer Breeding

Background Information and Methodology

Existing information on breeding birds of the study area was obtained from the OBBA for 100 km^2 survey squares 17MH30 and 17MH31, which overlap the study area (BSC et al, 2006). Of the 100 point count locations surveyed in both of these squares, 16 were placed within the natural environment study area, with 6 more located within 1 km. During OBBA surveys, 107 species were recorded as probable or confirmed breeders within these two survey blocks (see Table 3.7).

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Table 3.7 Birds Potentially Occurring within the Study Area and their Conservation Status

Species		Conservation Status[2]							Observed		
Common Name	Scientific Name	Partners In Flight Priority Species	Ontario			Canada			Ontario Breeding Bird Atlas Results 2001-2005[9]		2008 Site Visits
			SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	17MH30	17MH31	
Loons											
Common Loon	*Gavia immer*		S4B	NAR		N5B,N5N	NAR				√
Grebes											
Pied-billed Grebe	*Podilymbus podiceps*		S4B, SZN			N5B,N5N			FY		
Cormorants											
Double-crested Cormorant	*Phalacrocorax auritus*		S4B, SZN	NAR		N5B,N5N	NAR				
Herons, Egrets and Bitterns											
American Bittern	*Botaurus lentiginosus*		S4B, SZN			N4B,N3?N					√
Least Bittern	*Ixobrychus exilis*		S3B, SZN	THR	THR	N3B, NZN	THR	THR	T		
Great Blue Heron	*Ardea herodias*		S5B, SZN			N5B,NZN			NU	H	√
Great Egret	Casmerodius albus		S2B, SZN			N2B,NZN					
Green Heron	Butorides virescens		S4B, SZN			N4B,NZN			A	FY	
Black-crowned Night-Heron	Nycticorax nycticorax		S3B, SZN			N5B,NZN					
Swans											
Tundra Swan	*Cygnus columbianus*		N3N, N5B			S3B					√
Mute Swan	*Cygnus olor*		SE			NE					
Geese											
Canada Goose	*Branta canadensis*		S5B, SZN			N5B,N5N			FY	FY	√
Ducks											
Wood Duck	*Aix sponsa*		S5B, SZN			NZN,N5B			FY	FY	√
Gadwall	Anas strepera		S4B, SZN			N5B,N?N					
American Wigeon	*Anas americana*		S4B, SZN			N5B,N?N					
Northern Shoveler	*Anas clypeata*		S4B, SZN			N5B,NZN					
American Black Duck	*Anas rubripes*		S5B, SZN			N4B,N?N					
Mallard	*Anas platyrhynchos*		S5B, SZN			N5B,N5N			P	FY	
Blue-winged Teal	*Anas discors*		S5B, SZN			N5B,NZN			P		
Green-winged Teal	*Anas crecca*		S4B, SZN			N5B,N5ZN					√
Redhead	Aythya americana		S2B, SZN			N2N3N,N5B					
Hooded Merganser	*Lophodytes cucullatus*		S5B, SZN			N5B,N5N			FY		
Ruddy Duck	*Oxyura jamaicensis*		S2B, SZN			N5B,N5N					
Vultures											
Turkey Vulture	*Cathartes aura*		S4B, SZN			N4N5B,NZN			T	T	√
Hawks and Eagles											
Sharp-shinned Hawk	*Accipiter striatus*		S5B, SZN	NAR		N5B,NZN	NAR		H	CF	√
Cooper's Hawk	*Accipiter cooperii*		S4B, SZN	NAR		N4B,N4N	NAR		CF	CF	√
Northern Harrier	*Circus cyaneus*	√	S4B, SZN	NAR		N5B,N4N	NAR		H	CF	
Broad-winged Hawk	*Buteo platypterus*		S5B, SZN			N5B,NZN			A	H	√
Red-tailed Hawk	*Buteo jamaicensis*		S5B, SZN	NAR		N5B,NZN	NAR		A	A	√
Rough-Legged Hawk	*Buteo lagopus*		S1B	NAR		N4N,N5B	NAR				√
Bald Eagle	*Haliaeetus leucocephalus*	√	S4B, SZN	SC	SC	N4B,N4N	NAR		NY		
Golden Eagle	*Aquila chrysaetos*		S1B	END	END	N5B,N5N	NAR				√

Species		Conservation Status[2]							Observed		
Common Name	Scientific Name	Partners In Flight Priority Species	Ontario			Canada			Ontario Breeding Bird Atlas Results 2001-2005[9]		2008 Site Visits
			SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	17MH30	17MH31	
Falcons											
Merlin	*Falco columbarius*		S4B	NAR		N4N5N,N5B	NAR				√
American Kestrel	*Falco sparverius*	√	S5B, SZN			N5B,N5N			FY	FY	√
Upland Game Birds											
Ring-necked Pheasant	*Phasianus colchicus*		SE			NE					√
Ruffed Grouse	*Bonasa umbellus*		S5			N5				T	
Wild Turkey	*Melagris gallopavo*		S4			N3N4			FY	NE	√
Northern Bobwhite	*Colinus virginianus*	√	S1S2	END	END	N1N2	END	END			
Gruiformes											
American Coot	*Fulica americana*		S4B, SZN	NAR		N5B,NZN	NAR				
Common Moorhen	*Gallinula chloropus*		S4B, SZN			N3N4B					
King Rail	*Rallus elegans*		S2B, SZN	END	END	N2B	END	END			
Virginia Rail	*Rallus limicola*		S4B, SZN			N5B,N?N					
Sora	*Porzana carolina*		S4B, SZN			N5B,N?N			P		
Sandhill Crane	*Grus canadensis*		S4B, SZN			N5B					
Plovers											
Killdeer	*Charadrius vociferus*		S5B, SZN			N5B,NZN			FY	FY	√
Sandpipers and Phalaropes											
Spotted Sandpiper	*Actitis macularia*		S5B, SZN			N5B,NZN			H	FY	
Upland Sandpiper	*Bartramia longicauda*		S4B, SZN			N5B			AE		√
American Woodcock	*Scolopax minor*		S5B, SZN			N5B,NZN			S		
Common Snipe	*Gallinago gallinago*		S5B, SZN			N5B,NZN					
Gulls											
Ring-billed Gull	*Larus delawarensis*		S5B, SZN			N5B,N5N					√
Herring Gull	*Larus argentatus*		S5B, SZN			N5B,N5N					
Terns											
Common Tern	*Sterna hirundo*		S4B, SZN	NAR		N5B,NZN	NAR				
Forster's Tern	Sterna forsteri		S2S3B, SZN			N4N5B,NZN					
Black Tern	*Chlidonias niger*		S3B, SZN	SC	SC	N4B,NZN	NAR				
Doves											
Rock Dove	*Columba livia*		SE			NE			P	AE	√
Mourning Dove	*Zenaida macroura*		S5B, SZN			N5			FY	NE	√
Cuckoos											
Black-billed Cuckoo	*Coccyzus erythropthalmus*	√	S4B, SZN			N5B			S	S	√
Yellow-billed Cuckoo	*Coccyzus americanus*		S4B, SZN			N4B			CF	S	
Owls											
Great Horned Owl	*Bubo virginianus*		S5			N5			T	H	
Eastern Screech Owl	*Otus asio*		S5	NAR		N5	NAR		S	T	
Long-eared Owl	*Asio otus*		S4			N5B,N5N			S		
Goatsuckers and Swifts											
Common Nighthawk	*Chordeiles minor*		S4B, SZN	SC	SC	N5B	THR	THR	P	S	√
Whip-poor-will	*Caprimulgus vociferus*	√	S4B, SZN	THR	THR	N5B,NZN	THR				
Chimney Swift	*Chaetura pelagica*		S5B, SZN	THR	THR	N5B	THR	THR	T		

Species		Conservation Status[2]							Observed		
Common Name	Scientific Name	Partners In Flight Priority Species	Ontario			Canada			Ontario Breeding Bird Atlas Results 2001-2005[9]		2008 Site Visits
			SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	17MH30	17MH31	
Hummingbirds											
Ruby-throated Hummingbird	*Archilochus colubris*		S5B, SZN			N5B			S	FY	√
Kingfishers											
Belted Kingfisher	*Ceryle alcyon*	√	S5B, SZN			N5B,N5N			NU	FY	√
Woodpeckers											
Red-headed Woodpecker	*Merlanerpes erythrocephalus*	√	S3B, SZN	SC	SC	N3B	SC	SC (3)	A	H	
Red-bellied Woodpecker	*Malanerpes carolinus*		S4			N3N4			S	FY	√
Downy Woodpecker	*Picoides pubescens*		S5			N5			FY	P	√
Hairy Woodpecker	*Picoides villosus*		S5			N5			H	FY	√
Northern Flicker	*Colaptes auratus*	√	S5B, SZN			N5B,N?N			A	FY	√
Pileated Woodpecker	*Dryocopus pileatus*		S4S5			N5			H	S	
Flycatchers											
Eastern Wood-pewee	*Contopus virens*	√	S5B, SZN			N5B			CF	T	√
Alder Flycatcher	*Empidonax alnorum*		S5B, SZN			N5B			S		
Least Flycatcher	*Empidonax minimus*		S5B, SZN			N5B			S	S	√
Willow Flycatcher	*Empidonax traillii*	√	S5B, SZN			N5B			H	S	√
Great Crested Flycatcher	*Myiarchus crinitus*		S5B, SZN			N5B			P	AE	√
Yellow Bellied Fly Catcher	*Empidonax flaviventris*		S5B			N5B					√
Eastern Phoebe	*Sayornis phoebe*		S5B, SZN			N5B			AE	AE	√
Eastern Kingbird	*Tyrannus tyrannus*	√	S5B, SZN			N5B			DD	FY	√
Swallows											
Purple Martin	*Progne subis*		S4B, SZN			N5B			AE	AE	√
Tree Swallow	*Tachycineta bicolor*		S5B, SZN			N5B			AE	CF	√
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*		S5B, SZN			N5B			AE	H	√
Bank Swallow	*Riparia riparia*	√	S5B, SZN			N5B			AE	AE	
Cliff Swallow	*Petrochelidon pyrrhonota*		S5B, SZN			N5B			H	AE	√
Barn Swallow	*Hirundo rustica*		S5B, SZN			N5B			AE	FY	√
Crows and Jays											
Blue Jay	*Cyanocitta cristata*		S5			N5B,N5N			A	AE	√
American Crow	*Corvus brachyrhynchos*		S5B, SZN			N5B,N5N			FY	FY	√
Larks											
Horned Lark	*Eremophila alpestris*		S5B, SZN			N5B,N5N			P	T	√
Chickadees and Titmice											
Black-capped Chickadee	*Poecile atricapillus*		S5			N5			CF	CF	√
Tufted Titmouse	Baeolophus bicolor		S2S3			N2					
Nuthatches											
White-breasted Nuthatch	*Sitta carolinensis*		S5			N5			A	FY	
Creepers											
Brown Creeper	*Certhia americana*		S5B, SZN			N5				H	√
Wrens											
Carolina Wren	Thryothorus ludovicianus		S3S4			N3				S	
House Wren	*Troglodytes aedon*		S5B, SZN			N5B			FY	CF	√
Winter Wren	*Troglodytes troglodytes*		S5B			N5					√

Species		Conservation Status[2]							Observed		
Common Name	Scientific Name	Partners In Flight Priority Species	Ontario			Canada			Ontario Breeding Bird Atlas Results 2001-2005[9]		2008 Site Visits
			SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	17MH30	17MH31	
Sedge Wren	*Cistothorus platensis*		S4B, SZN	NAR		N5B	NAR				
Marsh Wren	*Cistothorus palustris*		S5B, SZN			N5B,N?N					
Kinglets and Gnatcatchers											
Blue-gray Gnatcatcher	Polioptila caerulea		S4B, SZN			N4B			A	AE	√
Ruby-crowned Kinglet	*Regulus calendula*		S5B, SZN			N5B				X	
Golden-crowned Kinglet	*Regulus satrapa*		S5B			N5					
Thrushes											
Eastern Bluebird	*Sialia sialis*		S4S5B,SZN	NAR		N5B,NZN	NAR		FY	AE	
Veery	*Catharus fuscescens*		S4B, SZN			N5B			S	H	
Wood Thrush	*Hylocichla mustelina*	√	S5B, SZN			N5B			P	A	√
Hermit Thrush	*Catharus guttatus*		S5B			N5B.NZN					√
American Robin	*Turdus migratorius*		S5B, SZN			N5B,N?N			CF	CF	√
Mimids											
Gray Catbird	*Dumetella carolinensis*		S5B, SZN			N5B			CF	NE	√
Northern Mockingbird	*Mimus polyglottos*		S4B, SZN			N3N4			H		
Brown Thrasher	*Toxostoma rufum*		S5B, SZN			N5B			CF	P	
Waxwings											
Cedar Waxwing	*Bombycilla cedrorum*		S5B, SZN			N5			P	P	√
Starlings											
European Starling	*Sturnus vulgaris*		SE			NE			CF	FY	√
Shrikes and Vireos											
Warbling Vireo	*Vireo gilvus*		S5B, SZN			N5B			AE	T	√
White-eyed Vireo	*Vireo griseus*		S2B, SZN			N2B			S		
Yellow-throated Vireo	*Vireo flavifrons*		S4B, SZN			N4B			S	S	√
Red-eyed Vireo	*Vireo olivaceus*		S5B, SZN			N5B			A	NE	√
Wood Warblers											
Blue-winged Warbler	*Vermivora pinus*	√	S4B, SZN			N4B			A	H	
Golden-winged Warbler	*Vermivora chrysoptera*	√	S4B, SZN			N4B			S		
Yellow Warbler	*Dendroica petechia*		S5B, SZN			N5B			CF	NU	√
Chestnut-sided Warbler	*Dendroica pensylvanica*		S5B, SZN			N5B			S	S	√
Pine Warbler	*Dendroica pinus*		S5B, SZN			N5B					
Cerulean Warbler	*Dendroica cerulean*	√	S3B, SZN	SC	SC	N3B	SC	SC			
American Redstart	*Setophaga ruticilla*		S5B, SZN			N5B			S	A	√
Prothonotary Warbler	*Protonotaria citrea*	√	S1S2B, SZN	END	END	N1N2B	END	END			
Ovenbird	*Seiurus aurocapillus*		S5B, SZN			N5B			S	S	√
Northern Waterthrush	*Seiurus noveboracensis*		S4B, SZN			N5B					
Mourning Warbler	*Oporornis philadelphia*		S5B, SZN			N5B			S		√
Common Yellowthroat	*Geothlypis trichas*		S5B, SZN			N5B			FY	A	√
Northern Parula	*Parula americana*		S4B			N5B					√
Connecticut Warbler	*Oporornis agilis*		S4B			N4B					√
Nashville Warbler	*Vermivora ruficapilla*		S5B			N5B					√
Black Throated Blue Warbler	*Dendroica caerulescens*		S5B			N5B					√
Black & White Warbler	*Mniotilta varia*		S5B			N5B					√

Species		Conservation Status[2]							Observed		
Common Name	Scientific Name	Partners In Flight Priority Species	Ontario			Canada			Ontario Breeding Bird Atlas Results 2001-2005[9]		2008 Site Visits
			SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	17MH30	17MH31	
Magnolia Warbler	*Dendroica magolia*		S5B			N5B					√
Prairie Warbler	*Dendroica discolor*	√	S3S4B	NAR		N3B	NAR				√
Yellow Rumped Warbler	*Dendroica coronata*		S5B			N5B,NZN					√
Canada Warbler	*Wilsonia canadensis*	√	S5B, SZN	SC	SC	N5B	THR	THR	H	S	
Yellow-breasted Chat	Icteria virens	√	S2S3B, SZN	SC	SC	N5B	SC	SC			
Tanagers and Cardinals											
Scarlet Tanager	*Piranga olivacea*		S5B, SZN			N5B			P	S	
Northern Cardinal	*Cardinalis cardinalis*		S5			N5			FY	NE	√
Summer Finches											
Rose-breasted Grosbeak	*Pheuticus ludovicianus*	√	S5B, SZN			N5B			CF	FY	√
Indigo Bunting	*Passerina cyanea*		S5B, SZN			N5B			CF	T	√
Towhees, Sparrows, and Allies											
Eastern Towhee	*Pipilo erythrophthalmus*	√	S4B, SZN			N4B,NZN			FY	NB	
Chipping Sparrow	*Spizella passerina*		S5B, SZN			N5B			CF	NE	√
Field Sparrow	*Spizella pusilla*	√	S5B, SZN			N5B			FY	NE	√
Clay-colored Sparrow	*Spizella pallida*		S4B, SZN			N5B				H	
Vesper Sparrow	*Pooecetes gramineus*	√	S4B, SZN			N5B			S	T	√
Savannah Sparrow	*Passerculus sandwichensis*	√	S5B, SZN			N5B,NZN			CF	T	√
Song Sparrow	*Melospiza melodia*		S5B, SZN			N5			CF	NB	√
Swamp Sparrow	*Melospiza georgiana*		S5B, SZN			N5B,NZN					
White Crowned Sparrow	*Zonotrichia leucophrys*		S4B			N5B,N5N					√
White Throated Sparrow	*Zonotrichia albicollis*		S5B			N5B,NZN					√
Dark-eyed Junco	*Junco hyemalis*		S5B			N5					√
Snow Bunting	*Plectrophenax nivalis*		SNA			N5B,N5N					√
Icterids											
Eastern Meadowlark	*Sturnella magna*	√	S5B, SZN			N5B			V	CF	√
Bobolink	*Dolichonyx oryzivorus*	√	S4B, SZN	THR	THR	N5B	THR		AE	FY	√
Red-winged Blackbird	*Agelaius phoeniceus*		S5B, SZN			N5B,NZN			FY	CF	√
Common Grackle	*Quiscalus quiscula*		S5B, SZN			N5B,NZN			FS	NE	√
Brown-headed Cowbird	*Molothrus ater*		S5B, SZN			N5B,NZN			FY	NE	√
Orchard Oriole	*Icterus spurius*		SZB, SZN			N4B			H	S	
Baltimore Oriole	*Icterus galbulla*	√	S5B, SZN			N5B,NZN			FY	NY	√
Winter Finches											
House Finch	*Carpodacus mexicanus*		SE			N5			P	T	√
Purple Finch	*Carpodacus purpureus*		S5B			N5B,N5N					√
Common Redpoll	*Carduelis flammea*		S4B			N5B,N5N					√
American Goldfinch	*Carduelis tristis*		S5B, SZN			N5B,N5N			CF	NE	√
Old World Sparrows											
House Sparrow	*Passer domesticus*		SE			NE5			FY	AE	√

Blank back

RPC02
RPC04
RPC01
RPC06
RPC08
Muirkirk Line
Highway 401
TOWNSHIP OF ORFORD
WEST ELGIN
RPC10
BAT02
VI03 *Fall*
RPC05
RPC03
BAT03
RPC11
RPC12
MacPherson Road
RPC09
BAT 01
FPC05
Muirkirk
FPC04
RPC07
RPC21
VI03 *Summer/Spring*
RPC17
RPC19
Duart
VI02
RPC13
FPC03
RPC14
Highgate
RPC18
RPC20
Scott Line
Duart Road
RPC15
FPC02
FPC01
Bury Road
VI01
RPC16
Dubs Drain
Fleming Creek
Clear Creek

Legend

- Bat Monitoring Station and Identifier (BAT01)
- Vista Survey Station and Identifier (VI01)
- Forest Point Count Station and Identifier (FPC01)
- Roadside Point Count Station and Identifier (RPC01)
- Biological Study Area
- Building
- Wetlands
- Woodland
- Woodlot Used for Baseline Investigation

Base data downloaded from
www.geographynetwork.ca
NRVIS data from MNR LIO.
UTM NAD 83.December 2009

0 0.25 0.5 1 Kilometres

NORTH

1:35,000

Figure 3.6
Saturn Power Inc.
Gesner Wind Energy Project
Biological Study Locations

HATCH

P:\SATURN\328628\GIS\Biological Study Locations.mxd

Back of figure

Information from these surveys was used to direct areas of focus for the baseline investigations of the proposed project. Breeding bird surveys were conducted during the summer on June 10 to 12 and repeated on June 24 and 25, 2008 to provide replicate coverage of the site. Surveys consisted of a combination of point counts, area searches, and vista surveys (also known as behaviour watches), as well as targeted surveys for certain Species at Risk to document species presence and movement within the study area. Monitoring locations are shown in Figure 3.6.

Roadside point count surveys (RPCs) were conducted at 20 stations along roads within the study area in representative habitats. Point counts commenced 0.5 hours prior to dawn and continued until a maximum of 5 hours after dawn (this was predominantly restricted to 2 to 3 hours past dawn). The starting RPC location was randomly assigned with a different starting point on each date. RPCs lasted 10 minutes, where a single observer recorded all birds noted through visual or auditory means during the period.

In addition to the RPCs, five point count locations were placed within each of the three woodlots for which access was granted. These surveys also involved the use of playback for species of conservation concern (discussed in greater detail below). In association with woodlot point counts, random area searches were conducted, consisting of an observer moving through the woodlot and documenting all species observed. Extensive searching, lasting 1 to 2 hours, was undertaken during these periods to detect breeding species. As with RPCs, these surveys were completed within 5 hours after dawn.

Finally, a 2-hour unlimited distance vista survey was conducted at each of three vista survey locations in order to document bird behaviour, as well as to focus on the movement of soaring birds which can commonly occur within the blade sphere of a wind turbine generator (defined as the risk zone). Locations, shown in Figure 3.6, were selected to provide representative coverage of the entire study area. Vista surveys were completed between 10:00 and 16:00 EST in order to provide coverage during the period of greatest activity for soaring birds.

In addition to the surveys described above, targeted investigations were conducted to detect (i) the possible occurrence of Species at Risk (for which presence was considered possible based on OBBA records) or (ii) species which may have otherwise been missed.

- **Acadian Flycatcher (*Empidonax virescens*) / Canada Warbler (*Wilsonia canadensis*) / Red-headed Woodpecker (*Melanerpes erythrocephalus*)** – As part of point counts within forest habitat, a broadcast survey of Acadian Flycatcher, Canada Warbler, and Red-headed Woodpecker calls was conducted. This, and all broadcast surveys described below, consisted of a period of passive observation, followed by broadcast individual calls of target species, followed by another period of passive observation.
- **Bald Eagle (*Haliaeetus leucocephalus*)** – Bald Eagles were targeted during vista surveys within the study area.
- **Least Bittern (*Ixobrychus exilis*)** – A broadcast survey was conducted at the borders of the recovered wetland habitat situated immediately north of the eastern portion of the Project location (see Figure 3.6). The survey followed the protocols of the Marsh Monitoring Program (Bird Studies Canada, 2009a), with the exception that only Least Bittern calls were broadcast.

- **Common Nighthawk (*Chordeiles minor*) / Chimney Swift (*Chaetura pelagica*) / American Woodcock (*Scolopax minor*)** – These species are considered to be crepuscular (meaning they are commonly observed at dusk). In order to detect their presence, 10-minute RPCs were conducted at dusk (starting 1.5 hours prior to sunset) at seven stations within the study area (those used during migration monitoring, see Section 3.3.3.2.2 below). As part of this survey, broadcast recordings of Common Nighthawk calls were played.

- **Owls** – Following Common Nighthawk surveys, broadcast surveys of owl calls were conducted from the same RPC locations during the first 2 hours following sunset in order to detect the presence of owl species. The following species were included in the playback: Short-eared Owl (*Asio flammeus*), Eastern Screech-owl (*Otus asio*), Long-eared Owl (*Asio otus*), Great Horned Owl (*Bubo virginianus*), Barred Owl (*Strix varia*), and Barn Owl (*Tyto alba*). Broadcast surveys were conducted as per the guidelines of the Ontario Nocturnal Owl Survey (Bird Studies Canada, 2009b).

Results of Baseline Investigations

Roadside Point Counts

Observations during RPCs were dominated by landbirds (~94%) of observations (Table 3.8), with blackbird species [European Starling (*Sturnus vulgaris*), Red-winged Blackbirds (A*gelaius phoeniceus*), and Common Grackle (*Quiscalis quicula*) predominately], making up approximately 59% of all birds observed (Table 3.8). These observations are consistent with agricultural environments in southern Ontario.

Fewer observations were made during early June, compared to later June, primarily resulting from a large flock of blackbirds (>100) noted from RPC 03 during the second visit. This large flock is likely the result of successful fledging of young from nests within the area. These large flocks comprised of several family groups, move and forage across a large area during this time.

Utilization rates for the summer breeding period are provided in Table 3.9. The site with the greatest level of utilization was RPCO8, where the large flock of blackbird species described above was noted. This portion of the study area borders on the edge of a larger wetland complex, and local activity of Red-winged Blackbirds is amplified as a result.

Within the season, there was no difference between visits with respect to utilization rate (based on the averages and spread of the Standard Deviations). Overall, an average of 0.561 $\pm$ 0.589 birds/ ha/min were recorded within the study area during the summer breeding period, though this is heavily influenced by the observation of the large flock at RPC08.

Table 3.8 Species Composition of Birds Observed During Summer 2009 Roadside Point Counts

	Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Landbirds			**1268 (93.7%)**
Ring-necked Pheasant	1		1 (0.1%)
Mourning Dove	11	27	38 (2.8%)
Rock Pigeon		6	6 (0.4%)
Belted Kingfisher		1	1 (0.1%)
Red-bellied Woodpecker	1	1	2 (0.2%)
Willow Flycatcher	2	2	4 (0.3%)
Eastern Wood-pewee		1	1 (0.1%)
Eastern Phoebe	1		1 (0.1%)
Eastern Kingbird	2		2 (0.2%)
Tree Swallow	1	2	3 (0.2%)
Bank Swallow	1		1 (0.1%)
Barn Swallow	5	15	20 (1.5%)
Cliff Swallow	7	2	9 (0.7%)
Blue Jay	1	1	2 (0.2%)
American Crow	25	10	35 (2.6%)
Horned Lark	32	30	62 (4.6%)
Black-capped Chickadee	1		1 (0.1%)
Wood Thrush	3		3 (0.2%)
American Robin	36	41	77 (5.7%)
Gray Catbird	3	8	11 (0.8%)
European Starling	70	104	174 (12.9%)
Chestnut-sided Warbler	1		1 (0.1%)
Yellow Warbler	7	3	10 (0.7%)
Common Yellowthroat	1	2	3 (0.2%)
Northern Cardinal	6	26	32 (2.4%)
Rose-breasted Grosbeak	1	2	3 (0.2%)
Savannah Sparrow	12	19	31 (2.3%)
Field Sparrow		1	1 (0.1%)
Chipping Sparrow	8	18	(1.9%)
Song Sparrow	20	24	44 (3.3%)
Blackbird Sp.		254	254 (18.8%)
Bobolink	1		1 (0.1%)
Common Grackle	93	78	171 (12.6%)
Red-winged Blackbird	103	70	173 (12.8%)
Brown-headed Cowbird	5	15	20 (1.5%)
Baltimore Oriole	1		1 (0.1%)
American Goldfinch	8	20	28 (2.1%)
House Sparrow	1	14	15 (1.1%)
Owls			**0 (0%)**
Raptors			**6 (0.4%)**
Northern Harrier	2		2 (0.2%)
Turkey Vulture	4		4 (0.3%)

	Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Shorebirds			**26 (1.9%)**
Killdeer	12	13	25 (1.9%)
Upland Sandpiper	1		1 (0.1%)
Waterbirds			**4 (0.3%)**
American Bittern	1		1 (0.1%)
Ring-billed Gull		3	3 (0.2%)
Waterfowl			**50 (3.7%)**
Canada Goose	45	5	50 (3.7%)
Total	**536**	**818**	**1354 (100%)**

Table 3.9 Bird Utilization Rates for the Summer Breeding Period

Station	Date				Site Average
	06/11 – 06/12		06/24 – 06/25		
	# obs.	Utilization Rate	# obs.	Utilization Rate	
RPC01	54	1.720	14	0.446	1.083 ± 0.901
RPC02	13	0.414	10	0.318	0.366 ± 0.068
RPC03	12	0.382	21	0.669	0.525 ± 0.203
RPC04	12	0.382	12	0.382	0.382 ± 0.000
RPC05	20	0.637	18	0.573	0.605 ± 0.045
RPC06	18	0.573	35	1.115	0.844 ± 0.383
RPC07	14	0.446	14	0.446	0.446 ± 0.000
RPC08	26	0.828	119	3.790	2.309 ± 2.094
RPC09	13	0.414	19	0.605	0.510 ± 0.135
RPC10	23	0.732	15	0.478	0.605 ± 0.180
RPC11	5	0.159	18	0.573	0.366 ± 0.293
RPC12	8	0.255	10	0.318	0.287 ± 0.045
RPC13	5	0.159	13	0.414	0.287 ± 0.180
RPC14	16	0.510	9	0.287	0.398 ± 0.158
RPC15	13	0.414	16	0.510	0.462 ± 0.068
RPC16	9	0.287	10	0.318	0.303 ± 0.023
RPC17	11	0.350	9	0.287	0.318 ± 0.045
RPC19	11	0.350	16	0.510	0.430 ± 0.113
RPC20	10	0.318	14	0.446	0.382 ± 0.090
RPC21	8	0.255	12	0.382	0.318 ± 0.090
Visit Average	15.1 ± 10.7	0.479 ± 0.340	20.2 ± 24.0	0.643 ± 0.763	
Season Average	0.561 ± 0.589				

Woodlot Area Searches and Point Counts

The three woodlots that were searched within the study area support a diverse array of avifauna (Table 3.10). The avifaunal community in these woodlots is composed primarily of landbirds (90% of those observed during area searches and 100% of those observed during point counts). Landbirds are expected to dominate small woodlots in this area. During area searches, the three most commonly observed species were Common Grackle, Yellow Warbler (*Dendroica petechia*), and Eastern Wood-pewee (*Contopus virens*), with a similar composition during point counts where Common Grackle and Yellow Warbler had the highest observed levels, while Wood Thrush (*Hylocichla mustelina*) and Red-eyed Vireo (*Vireo olivaceus*) were the next most prominent.

Table 3.10 Species Composition of Birds Observed During Summer 2008 Woodlot Area Searches and Point Counts

	Area Searches			Point Counts		
	Number by Date			Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Landbirds			**197 (90.0%)**			**108 (100.0%)**
Mourning Dove					1	1 (0.9%)
Black-billed Cuckoo		1	1 (0.5%)		1	1 (0.9%)
Ruby-throated Hummingbird					1	1 (0.9%)
Downy Woodpecker	4	3	7 (3.2%)	3		3 (2.8%)
Red-bellied Woodpecker	3	1	4 (1.8%)	1	3	4 (3.7%)
Northern Flicker		1	1 (0.5%)	1		1 (0.9%)
Eastern Wood-pewee	4	9	13 (5.9%)	2	4	6 (5.6%)
Great-crested Flycatcher					1	1 (0.9%)
Yellow-bellied Flycatcher					1	1 (0.9%)
Eastern Kingbird		1	1 (0.5%)			
Blue Jay	1	2	3 (1.4%)			
American Crow	1	3	4 (1.8%)	2	3	5 (4.6%)
Brown Creeper	1		1 (0.5%)			
House Wren	6	6	12 (5.6%)	1	6	7 (6.5%)
Blue-gray Gnatcatcher	1		1 (0.5%)			
American Robin	1	2	3 (1.4%)	5	2	7 (6.5%)
Wood Thrush		6	6 (2.7%)	4	5	9 (8.3%)
Gray Catbird	4	5	9 (4.1%)	1	3	4 (3.7%)
Red-eyed Vireo	3	6	9 (4.1%)	4	5	9 (8.3%)
Warbling Vireo	2		2 (0.9%)			
Chestnut-sided Warbler		4	4 (1.8%)	1	2	3 (2.8%)
Connecticut Warbler	1		1 (0.5%)			
Magnolia Warbler					1	1 (0.9%)
American Redstart				1		1 (0.9%)
Yellow Warbler	10	12	22 (10.1%)	6	5	11 (10.2%)
Ovenbird				1		1 (0.9%)
Northern Cardinal	2	6	8 (3.7%)	4	4	8 (7.4%)
Rose-breasted Grosbeak		1	1 (0.5%)	1	1	2 (1.9%)
Indigo Bunting	2	3	5 (2.3%)		1	1 (0.9%)
Song Sparrow	2	3	5 (2.3%)			
Chipping Sparrow	1		1 (0.5%)			
Common Grackle	5	53	58 (26.5%)	3	8	11 (10.2%)
Red-winged Blackbird				2	2	4 (3.7%)
Brown-headed Cowbird				1	1	2 (1.9%)
Baltimore Oriole		4	4 (1.8%)		2	2 (1.9%)
House Finch		1	1 (0.5%)			
American Goldfinch		6	6 (2.7%)		1	1 (0.9%)
Owls			**0 (0%)**			**0 (0%)**

	Area Searches			Point Counts		
	Number by Date			Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Raptors			**10 (4.6%)**			**0 (0%)**
Northern Harrier	1		1 (0.5%)			
Red-tailed Hawk	4	2	6 (2.7%)			
Turkey Vulture	3		3 (1.4%)			
Shorebirds			**0 (0%)**			**0 (0%)**
Waterbirds			**0 (0%)**			**0 (0%)**
Waterfowl			**12 (5.5%)**			**0 (0%)**
Canada Goose	8		8 (3.7%)			
Wood Duck	4		4 (1.8%)			
Total	**44**	**64**	**108 (100%)**			**108 (100%)**

Vista Surveys

Proportions by species guild during vista surveys were different than area searches or point counts, though landbirds still represented the majority (at 62.2%). Raptors comprised 34.6% of results [with Turkey Vultures (*Catharses aura*) making up the majority of those observed moving through the Project location (Table 3.11)]. No real difference in species observed between surveys was noted. Observations during vista surveys were dominated by Turkey Vulture, Horned Lark, and blackbird sp.

Table 3.11 Species Composition of Birds Observed During Summer 2008 Vista Surveys

	Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Landbirds			**194 (62.2%)**
Mourning Dove	4	5	9 (2.9%)
Rock Pigeon		1	1 (0.3%)
Willow Flycatcher	1	2	3 (1.0%)
Bank Swallow	2	2	4 (1.3%)
Barn Swallow		7	7 (2.2%)
Tree Swallow		6	6 (1.9%)
Purple Marten		1	1 (0.3%)
American Crow	5	1	6 (1.9%)
Horned Lark	34	29	63 (20.2%)
Brown Creeper	1		1 (0.3%)
American Robin	5	4	9 (2.9%)
Gray Catbird	1	1	2 (0.6%)
European Starling	4	2	6 (1.9%)
Prairie Warbler	1		1 (0.3%)
Northern Cardinal		2	2 (0.6%)
Song Sparrow	1	1	2 (0.6%)
Chipping Sparrow	2	1	3 (1.0%)
Savannah Sparrow		5	5 (1.6%)

	Number by Date		
Species	**06/11 – 06/12**	**06/24 – 06/25**	**Total # (% of Total)**
Vesper Sparrow	2		2 (0.6%)
Blackbird Sp.		27	27 (8.7%)
Common Grackle	5	1	6 (1.9%)
Bobolink	2	1	3 (1.0%)
Red-winged Blackbird	6	7	13 (4.2%)
Brown-headed Cowbird	5	2	7 (2.2%)
House Finch		2	2 (0.6%)
American Goldfinch		3	3 (1.0%)
Owls			**0 (0%)**
Raptors			**108 (34.6%)**
Northern Harrier	1		1 (0.3%)
Cooper's Hawk	1	1	2 (0.6%)
Red-tailed Hawk	9	5	14 (4.5%)
Turkey Vulture	35	56	91 (29.2%)
Shorebirds			**8 (2.6%)**
Killdeer	5	3	8 (2.6%)
Waterbirds			**2 (0.6%)**
Common Tern	2		2 (0.6%)
Waterfowl			**0 (0.0%)**
Total	**134**	**178**	**312 (100%)**

Flight heights of birds observed during vista surveys varied by group (Figure 3.7). Approximately 70% of landbirds were observed below the risk zone during the summer. Again, most landbirds are not commonly active at heights well above canopy height that would place them in danger of entering the risk zone. The notable exception to this would be Horned Larks, which perform an aerial flight display during the breeding season that regularly brings them into the lower portion of the risk zone. Horned Larks breeding in close proximity to vista surveys were observed making several flight displays of varying length (from <1 min to >5 min) throughout the 2-hour observation period.

Shorebirds [comprised entirely of Killdeer (*Charadrius vociferus*)] were also observed most commonly below the risk zone.

Raptors (predominantly Turkey Vultures) were observed most commonly soaring in the risk zone. As many raptor species forage on the wing at heights above the ground, this is not unexpected. All waterbirds, two Common Tern (*Sterna hirundo*), were observed within the risk zone. This was the only observation of terns within the study area and likely represents an uncommon movement of these individuals between foraging grounds.

Overall, most birds observed during vista surveys were moving either below or within the risk zone, with activity above the risk zone observed relatively infrequently.

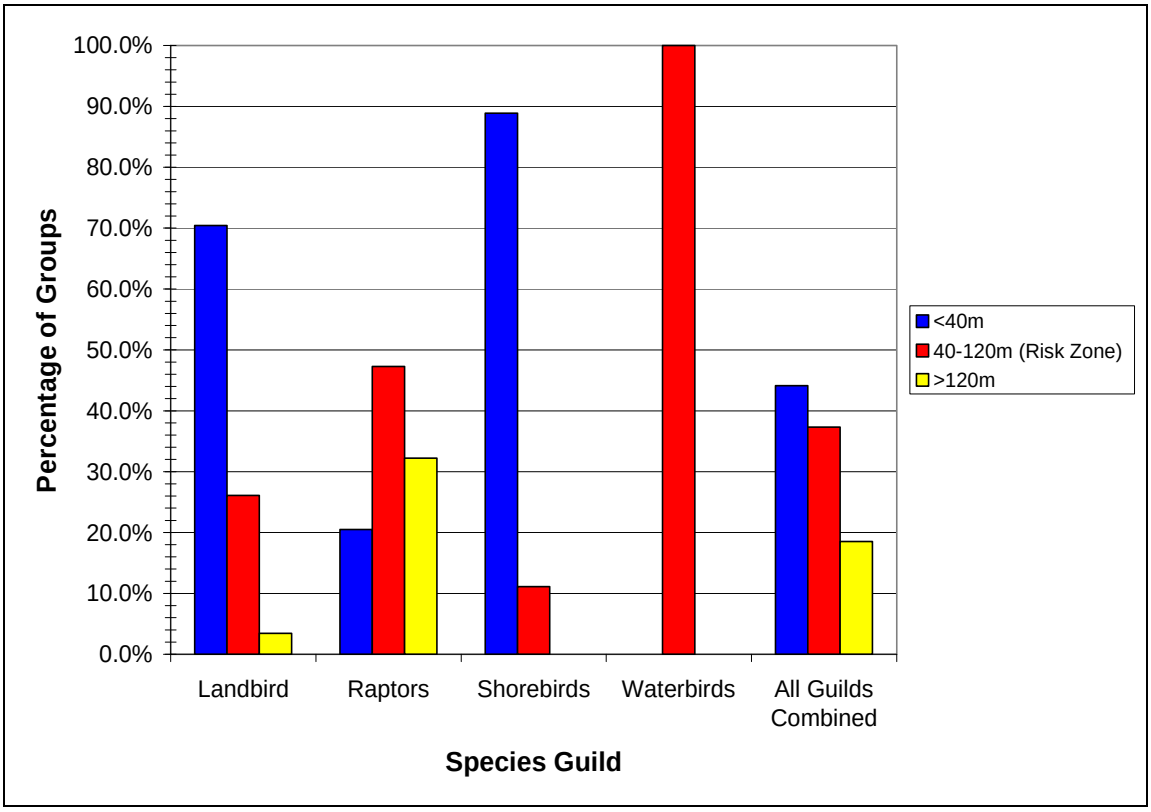


Figure 3.7 Distribution of Bird Flight Heights Observed During Vista Surveys in Summer 2008 by Species Guild

Wetland Point Count

Observations from the recovered wetland habitat in the northern extreme of the site were dominated by blackbird sp. (>85%; Table 3 12). This is the result of Red-winged Blackbirds resident to the marsh, and other blackbirds returning to this site to roost for the evening. Composition within this fairly poor wetland habitat is as would be expected for the wetland and surrounding woods/fields.

Common Nighthawk Surveys

No Common Nighthawk were observed during playback surveys in the summer (however, see notes on observations in Section 3.3.3.2.3 – Fall Migration).

Owl Surveys

During owl surveys, Eastern Screech Owls (*Otus asio*) were heard calling from two locations, OWL05 (located at RPC12 in the southeastern corner of the study area) and OWL09 (located at RPC17 in centre of the study area).

Though no other owls were observed during playback studies, it is expected that others are likely present within the study area that remained undetected. However, the absence of owl observations from within the study area suggests that the populations of owls is small.

Table 3.12 Species Composition of Birds Observed During Summer 2008 Wetland Point Count

	Number by Date		
Species	**06/10**	**06/24**	**Total # (% of Total)**
Landbirds			**180 (98.9%)**
Tree Swallow	1	4	5 (2.8%)
Barn Swallow	1	1	2 (1.1%)
Blue Jay	1		1 (0.6%)
American Crow		1	1 (0.6%)
American Robin		1	1 (0.6%)
European Starling	100	1	101 (55.5%)
Yellow Warbler	2	1	3 (1.7%)
Common Yellowthroat		1	1 (0.6%)
Northern Cardinal		2	2 (1.1%)
Song Sparrow		1	1 (0.6%)
Blackbird Sp.		40	40 (22.0%)
Common Grackle	7	1	8 (4.4%)
Red-winged Blackbird	5	6	11 (6.0%)
Baltimore Oriole	1		1 (0.6%)
American Goldfinch		2	2 (1.1%)
Owls			**0 (0%)**
Raptors			**0 (0%)**
Shorebirds			**2 (1.1%)**
Spotted Sandpiper	2		2 (1.1%)
Waterbirds			**0 (0%)**
Waterfowl			**0 (0%)**
Total	**120**	**62**	**182 (100%)**

Summer Breeding Summary

Bird populations observed during the summer breeding season are typical of agricultural lands and their associated heavily fragmented woodlands in southwestern Ontario. Movements and use of the Project location by birds are consistent with known characteristics of the individual species. No significant wildlife habitats were noted during breeding bird surveys.

No Species at Risk were observed during breeding bird surveys within the Project location; however, Chimney Swifts, a species considered to be threatened by COSEWIC were observed foraging over the town of Highgate, just outside of the study area. Swifts spend ~50% of their time foraging within 0.5 km of the nest, but some individuals are known to forage at distances of 3 to 6 km from the nest (Cadman, 2007). This would provide some overlap with the study area, however none were ever observed outside of the village limits.

Of the 28 priority species identified for BCR 13 that were considered to potentially occur within the study area (see Table 3.3), 17 (including the Chimney Swift described above) were recorded within the study area during baseline investigations. These species were as follows.

• Northern Harrier	• Black-billed Cuckoo	• Belted Kingfisher
• Northern Flicker	• Eastern Wood-Pewee	• Willow Flycatcher
• Eastern Kingbird	• Wood Thrush	• Prairie Warbler
• Rose-breasted Grosbeak	• Field Sparrow	• Vesper Sparrow
• Savannah Sparrow	• Bobolink	• Baltimore Oriole
• Bank Swallow	• Eastern Meadowlark	

For the majority of these species, only one or two individuals were observed within the study area. However, Savannah Sparrow (*Passerculus sandwichensis*) represented 2.3% of all birds recorded during RPCs and Eastern Wood-Pewees and Wood Thrush were commonly recorded within both woodlot area searches and point counts. Populations of all these species are considered to be secure or apparently secure within both Ontario and Canada.

3.3.3.2.2 Spring Migration

Background Information and Methodology

There are no documented spring migration monitoring stations within the region, and therefore there is a relative absence of existing quantitative information. However, it is well-known that the area around Rondeau Provincial Park is considered to be important for migratory birds, with significant numbers of migrating waterfowl [particularly Tundra Swan (*Cygnus columbianus*) and Greater Scaup (*Aythya marila*)] and shorebirds [particularly American Golden-Plover (*Pluvialis dominica*) and Black-bellied Plover (*Pluvialis squatarola*)] (BSC et al, 2008a). Though it is known that hundreds to thousands of Tundra Swans and plovers can be regularly observed on the agricultural fields surrounding Rondeau, little is known about their use of the study area.

In order to supplement existing information, bird surveys were conducted during the spring migration period to document species presence and movement within the study area. Three visits to the site were conducted on April 2, April 24, and May 13, 2008. As with summer breeding monitoring, RPCs, area searches, and vista surveys of woodlots were conducted. Monitoring locations are shown in Figure 3.6.

RPCs were started within a half-hour of sunrise and were completed between 05:59 and 08:47 EST. Surveys were conducted at fewer point count locations (7) than during summer breeding monitoring in order to allow for vista surveys to detect large movements of birds, in particular soaring raptors. RPCs utilized during spring monitoring include RPC01, RPC04, RPC05, RPC09, RPC12, RPC15, and RPC17.

Random area searches of the three woodlots available for search were also conducted with searches lasting between 25 and 40 minutes depending on the size of the woodlot and level of activity.

Vista surveys were conducted following woodlot area searches, following the protocols identified for summer bird monitoring.

Results from Baseline Investigation

Roadside Point Counts

Observations during RPCs were again dominated by landbirds (~80% of observations; Table 3.13), with Red-winged Blackbirds (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), and American Robins (*Turdus migratorius*), the three most commonly observed species (Table 3.13).

Table 3.13 Species Composition of Birds Observed During Spring 2009 Roadside Point Counts

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
Landbirds				**423 (80.1%)**
Wild Turkey		1		1 (0.2%)
Mourning Dove	1	6	4	11 (2.1%)
Red-bellied Woodpecker	1		1	2 (0.4%)
Downy Woodpecker	1	4		5 (1.0%)
Barn Swallow			1	1 (0.2%)
Blue Jay	2	2	1	5 (1.0%)
American Crow	10	9	7	26 (4.9%)
Horned Lark	10	8	4	23 (4.4%)
Golden-crowned Kinglet	2			2 (0.4%)
Wood Thrush			1	1 (0.2%)
American Robin	14	14	11	39 (7.4%)
Gray Catbird	1	1	3	5 (1.0%)
European Starling	4	2	1	7 (1.3%)
Yellow Warbler			4	4 (0.8%)
Common Yellowthroat			2	2 (0.4%)
Northern Cardinal	5	4	2	11 (2.1%)
Dark-eyed Junco	10			10 (1.9%)
Savannah Sparrow		3	4	7 (1.3%)
Chipping Sparrow	1	2	1	4 (0.8%)
Song Sparrow	8	10	7	25 (4.7%)
White-crowned Sparrow		1		1 (0.2%)
Blackbird Sp.	10			10 (1.9%)
Common Grackle	36	18	22	76 (14.4%)
Red-winged Blackbird	21	65	22	108 (20.5%)
Brown-headed Cowbird	7		8	15 (2.8%)
Baltimore Oriole			3	3 (0.6%)
American Goldfinch		3	6	9 (1.7%)
House Sparrow		9	1	10 (1.9%)
Owls				**0 (0%)**
Raptors				**1 (0.2%)**
Red-tailed Hawk			1	1 (0.2%)
Shorebirds				**14 (2.7%)**
Killdeer	5	4	5	14 (2.7%)

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
Waterbirds				**10 (1.9%)**
Ring-billed Gull	9	1		10(1.9%)
Waterfowl				**80 (15.2%)**
Common Loon		11		11 (2.1%)
Tundra Swan	30			30 (5.7%)
Canada Goose	5	8	17	30 (5.7%)
Mallard	1	4		5 (1.0%)
Unknown species		4		4 (0.8%)
Total	**194**	**194**	**140**	**528 (100%)**

The timing of the first visit in early April corresponded with the movement of Tundra Swans through the study area, with several large flocks (~50 birds) observed outside of the RPCs on fields around the study area. During the second visit in the end of February, a small movement of Common Loons through the study area appeared to be occurring, while by mid-May, warbler species and other later-arriving birds were beginning to be observed in the study area. Large flocks of Snow Buntings or Horned Larks were no longer observed during the spring, likely signifying their return to their breeding grounds or resident territories.

Fewer observations were made during the visit in May, compared to the visits in April, indicating that migration was starting to near its end.

Utilization rates for the spring migration period are provided in Table 3.14. The site with the greatest level of utilization was RPC09. Observations at this station, located in agricultural land near a small stand of evergreen trees in the eastern half of the study area, were predominated by pairs to small groups (6 to 8) of Common Grackles moving between the fields and the trees.

Table 3.14 Bird Utilization Rates for the Spring 2008 Migration Period

Station	Date						Site Average
	04/02		04/24		05/13		
	# obs.	Utilization Rate	# obs.	Utilization Rate	# obs.	Utilization Rate	
RPC01	10	0.318	17	0.541	18	0.573	0.478 ± 0.139
RPC04	9	0.287	17	0.541	8	0.127	0.361 ± 0.157
RPC05	18	0.573	6	0.191	8	0.191	0.340 ± 0.205
RPC09	17	0.541	33	1.051	24	0.191	0.786 ± 0.255
RPC12	8	0.255	13	0.414	8	0.159	0.308 ± 0.092
RPC15	5	0.159	10	0.318	7	0.096	0.234 ± 0.080
RPC17	8	0.255	7	0.223	8	0.159	0.244 ± 0.018
Visit Average	10.7 ± 4.9	0.341 ± 0.156	14.7 ± 9.2	0.469 ± 0.292	11.6 ± 6.7	0.369 ± 0.213	
Season Average	0.393 ± 0.223						

Within the season, there was no difference between visits with respect to utilization rate. Overall, an average of 0.393 ± 0.223 birds/ha/min were recorded within the study area during the spring migration period.

Woodlot Area Searches

Landbirds dominated the woodlots making up around 53% of observations (Table 3.15). This would be higher with the exception of some large flocks of waterfowl and waterbirds noted near some of the woodlots in early April. When these observations are excluded, landbirds comprised approximately 88% of those birds observed in woodlots during the spring.

Table 3.15 Species Composition of Birds Observed During Spring 2008 Woodlot Area Searches

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
Landbirds				**201 (53.2%)**
Wild Turkey	1			1 (0.3%)
Mourning Dove		1	1	2 (0.5%)
Downy Woodpecker	3	2	1	6 (1.6%)
Red-bellied Woodpecker	1	4	4	9 (2.4%)
Northern Flicker			1	1 (0.3%)
Eastern Wood-pewee			1	1 (0.3%)
Great-crested Flycatcher			1	1 (0.3%)
Tree Swallow		1	3	4 (1.1%)
Blue Jay		2	3	5 (1.3%)
American Crow		1		1 (0.3%)
Horned Lark		1	4	5 (1.3%)
Black-capped Chickadee	3			3 (0.8%)
Winter Wren			1	1 (0.3%)
Golden-crowned Kinglet	10	4		14 (3.7%)
American Robin	3	4	4	11 (2.9%)
Wood Thrush			4	4 (1.1%)
Gray Catbird			5	5 (1.3%)
European Starling		2		2 (0.5%)
Connecticut Warbler			1	1 (0.3%)
Nashville Warbler			2	2 (0.5%)
Black-throated Green Warbler			1	1 (0.3%)
Black-throated Blue Warbler			1	1 (0.3%)
Black-and-White Warbler			1	1 (0.3%)
American Redstart			2	2 (0.5%)
Common Yellowthroat			2	2 (0.5%)
Yellow Warbler			14	14 (3.7%)
Northern Parula			2	2 (0.5%)
Ovenbird			2	2 (0.5%)
Northern Cardinal		2	2	4 (1.1%)
Rose-breasted Grosbeak			8	8 (2.1%)
Indigo Bunting			2	2 (0.5%)
Savannah Sparrow		2		2 (0.5%)
Field Sparrow			1	1 (0.3%)
Song Sparrow		4	4	8 (2.1%)

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
White-throated Sparrow		1		1 (0.3%)
Common Grackle	7	2	6	15 (4.0%)
Red-winged Blackbird		25	24	49 (13.0%)
Brown-headed Cowbird			1	1 (0.3%)
Baltimore Oriole			2	2 (0.5%)
American Goldfinch		3	1	4 (1.1%)
Owls				**0 (0%)**
Raptors				**7 (1.9%)**
Cooper's Hawk		1	1	2 (0.5%)
Turkey Vulture	2	2	1	5 (1.3%)
Shorebirds				**1 (0.3%)**
Killdeer			1	1 (0.3%)
Waterbirds				**51 (13.5%)**
Great Blue Heron		1		1 (0.3%)
Ring-billed Gull	50			50 (13.2%)
Waterfowl				**118 (31.2%)**
Tundra Swan	74			74 (19.6%)
Canada Goose		5	12	17 (4.5%)
Mallard			2	2 (0.5%)
Wood Duck	25			25 (6.6%)
Total	**179**	**70**	**129**	**378 (100%)**

As with RPCs, distinct periods of migration could be observed. An influx of waterfowl [Tundra Swan and Wood Duck (*Aix sponsa*)] was noted in early April. A large flock of 60 Tundra Swans was observed on the fields just outside of the northern woodlot, while a flock of 25 Wood Ducks was observed on vernal pools within the southern woodlot. By mid-May, woodlots were dominated by passerine species, with both resident breeders [such as Great-crested Flycatcher (*Myiarchus crinitus*) and Yellow Warbler (*Dendroica petechia*)] and migrants [such as Nashville Warbler (*Vermivora ruficapilla*) and Northern Parula (*Parula americana*)] noted. No significant numbers of warblers were observed within the woodlots during this period, suggesting that the site is not located along a central migration corridor and is not a key stopover site, but rather provides some refuge along the broad-front of spring warbler migration.

Vista Surveys

Proportions by species guild during vista surveys were different than area searches or point counts, with landbirds still holding the greatest representation (at 47.5%); however, raptors now comprised 22.4% of results (with Turkey Vultures making up the majority of those observed moving through the Project location; Table 3.16). This shift is the result of observations being conducted during the middle of the day, which is the peak period of raptor movement. A Rough-legged Hawk (*Buteo lagopus*), a species that breeds in extreme northern Ontario and the Canadian Territories, was

observed moving through the study area in early April. Also in early April, a large movement of Tundra Swans was recorded at one of the sites, with 165 swans observed flying through the study area in a period of 10 minutes. A large group of Ring-billed Gulls were also observed around a small temporary pond in a field.

As with other surveys, migrant passerines were noted back on the site during the visit in mid-May, with several species that had not been previously recorded, observed (Table 3.16).

Table 3.16 Species Composition of Birds Observed During Spring 2008 Vista Surveys

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
Landbirds				**401 (47.5%)**
Mourning Dove	4	7	4	16 (1.9%)
Rock Pigeon	4			4 (0.5%)
Ruby-throated Hummingbird			1	1 (0.1%)
Downy Woodpecker			3	3 (0.4%)
Northern Flicker	1			1 (0.1%)
Northern Rough-winged Swallow			6	6 (0.7%)
Tree Swallow		4	4	8 (1.0%)
Bank Swallow			2	2 (0.2%)
Barn Swallow			10	10 (1.2%)
Purple Marten			4	4 (0.5%)
Blue Jay			3	3 (0.4%)
American Crow	26	8	5	39 (4.7%)
Horned Lark	18	20	14	52 (6.3%)
American Robin	3	4	4	11 (1.3%)
Gray Catbird			2	2 (0.2%)
European Starling	12	11	2	25 (3.0%)
Northern Cardinal	4	1	3	8 (1.0%)
Savannah Sparrow		3	2	5 (0.6%)
Chipping Sparrow		2	1	3 (0.4%)
Song Sparrow	3	2	2	7 (0.9%)
White-throated Sparrow		1		1 (0.1%)
Blackbird Sp.	70	2		72 (8.7%)
Bobolink			2	2 (0.2%)
Common Grackle	1	22	17	40 (4.84%)
Red-winged Blackbird	1	2	8	11 (1.3%)
Brown-headed Cowbird	5	4	10	19 (2.3%)
American Goldfinch		3	43	46 (5.6%)
Owls				**0 (0%)**
Raptors				**189 (22.4%)**
Cooper's Hawk	1	1		2 (0.2%)
Sharp-shinned Hawk		1	1	2 (0.2%)
Northern Harrier		1		1 (0.1%)
Red-tailed Hawk	1	5	5	11 (1.3%)
Rough-legged Hawk	1			1 (0.1%)
Turkey Vulture	49	70	53	172 (20.8%)

	Number by Date			
Species	**04/02**	**04/24**	**05/13**	**Total # (% of Total)**
Shorebirds				**15 (1.8%)**
Killdeer	10	3	2	15 (1.8%)
Waterbirds				**54 (6.4%)**
Ring-billed Gull	54			54 (6.4%)
Waterfowl				**185 (21.9%)**
Tundra Swan	165			165 (19.7%)
Canada Goose			2	2 (0.2%)
Unknown species		18		18 (2.0%)
Total	**436**	**195**	**213**	**844 (100%)**

Flight heights of birds observed during vista surveys varied by group (Figure 3.8). As would be expected, the vast majority of landbird activity was observed below the risk zone during spring migration monitoring. Most landbirds are not commonly active at heights well above canopy height that would place them in danger of entering the risk zone. Furthermore, as vista surveys were conducted mid-day, migratory movements of landbirds, when they predominantly fly at heights >125 m (Kingsley and Whittam, 2005), would not be detected. Similarly, shorebirds (comprised entirely of Killdeer) were observed most commonly below the risk zone.

Raptors were observed most commonly soaring in the risk zone, which is not unexpected.

Waterbirds, entirely Ring-billed Gulls (*Larus delawarensis*), were observed most commonly either below or within the risk zone. This corresponds with the local movements that were observed of birds flying in and landing at a small temporary pond on an agricultural field near one of the stations. There was little difference with respect to the distribution of waterfowl amongst all flight height categories.

Overall, most birds observed during vista surveys were moving either below or within the risk zone, with activity above the risk zone observed relatively infrequently.

Observations during the Spring Migration period were consistent with an area of broad-front migration. Various movements of waterfowl and passerines, likely originating from the Clear Creek or Rondeau areas, were noted. With respect to raptor migration, there was very little evidence that the site is found along a migration corridor for this species, as only a single northern breeder was noted during all visits. Use of the site by other raptors is consistent with use during the summer breeding and suggestive of the lack of migration movements (see Section 3.3 below).

Activity within the woodlots of the study area was relatively quiet until the last observation in May, when warbler species had returned to the study area.

No significant wildlife habitat was identified within the study area during spring migration monitoring.

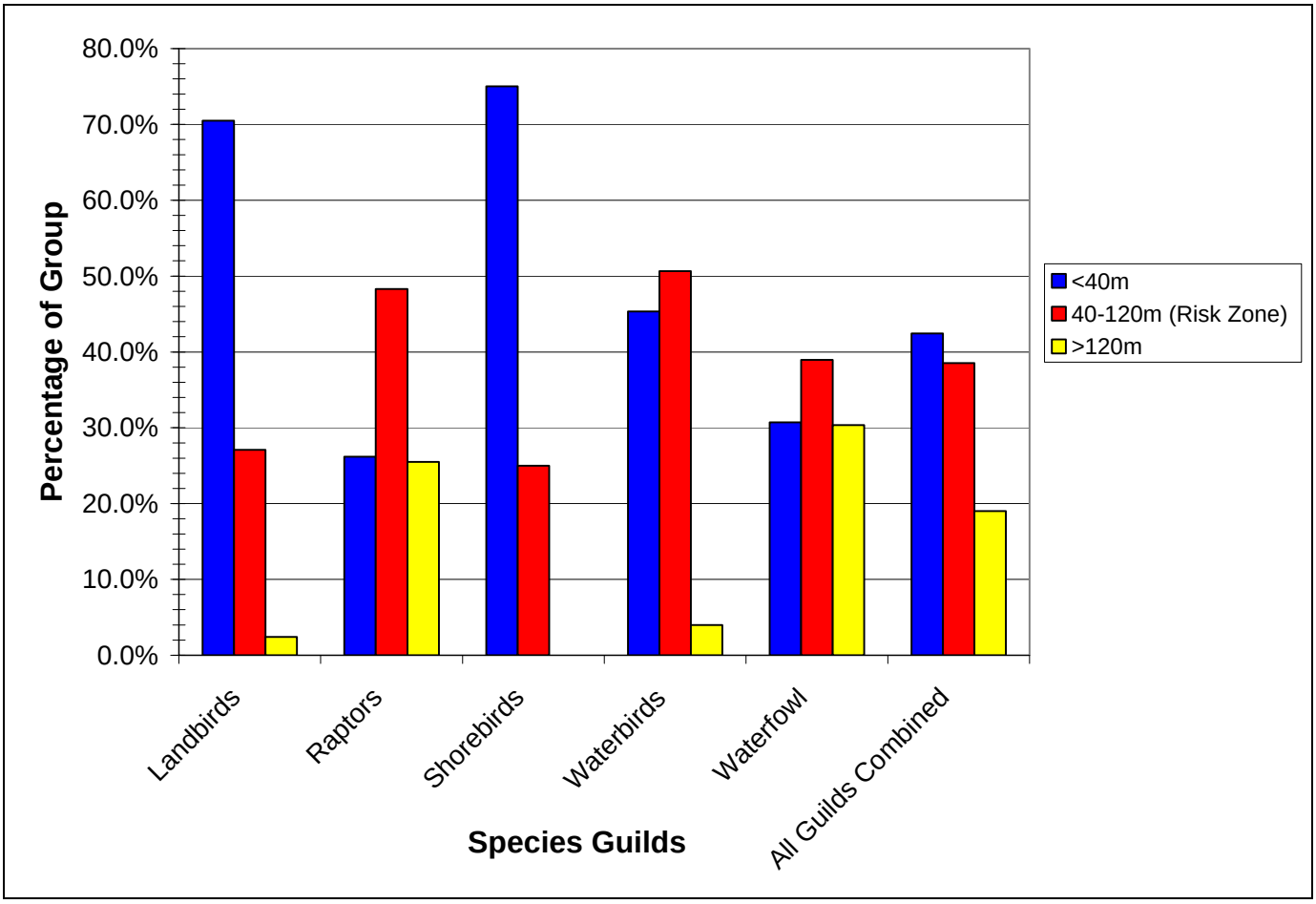


Figure 3.8 Distribution of Bird Flight Heights Observed During Vista Surveys in Spring 2008 by Species Guild Spring Migration Summary

Of the 28 priority species identified for BCR 13 that were considered to potentially occur within the study area (see Table 3.3), 10 were recorded within the study area during baseline investigations. These species were as follows:

- Northern Harrier
- Wood Thrush
- Savannah Sparrow
- Bank Swallow
- Northern Flicker
- Rose-breasted Grosbeak
- Bobolink
- Eastern Wood-Pewee
- Field Sparrow
- Baltimore Oriole

Numbers of these individuals were low within the study area, with each species representing at most 1% of observations during a given period. Populations of all these species are considered to be secure or apparently secure within both Ontario and Canada.

No observations of plovers were noted during the spring migration period, suggesting that though these species are commonly observed at Rondeau, they are not regularly occurring within the study area. However, Tundra Swans were noted within the study area. Numbers observed suggest some use, however this is likely occurring on a broad front given that only a few hundred were observed crossing the study area, while several thousand would be recorded around Rondeau at any given time. This suggests that Tundra Swans are concentrating in the vicinity of Rondeau, and then dispersing from there across a broad-front on the remainder of their northern push.

3.3.3.2.3 Fall Migration

Background Information and Methods

There are no documented fall migration monitoring stations within the region, and therefore there is a relative absence of existing quantitative information. However, as during spring, thousands of Black-bellied Plovers and American Golden-Plovers can be found feeding in the open fields around Rondeau Provincial Park (BSC et al., 2008a); though it is not currently known if any are to be found within the study area. Further, it is well known that the shoreline of Lake Erie concentrates hawks moving south in the fall as they travel west around Lake Erie. The nearest hawk watch station to the site is the Hawk Cliff Hawkwatch, located on the north shore of Lake Erie, just west of Port Stanley, ON (~53 km east-northeast of the Project location). This hawk watch station, which has been active for over 30 years, recorded more than 141,000 raptors passing the station in the fall of 2008, with large numbers of Broad-winged Hawks (*Buteo platypterus*; >100,000), Turkey Vultures (~22,000), and Sharp-shinned Hawks (*Accipter striatus*; ~9000) (Hawk Migration Association of North America, 2009). Similar numbers could be expected along the shoreline of Lake Erie in the vicinity of the Project location. However, given the distance from the shoreline (>5 km) large concentrations are not expected over the study area.

In order to provide specific information on fall migration within the study area, surveys were conducted on August 19 to 21, September 3 to 4, October 2, and October 30, 2008. The first two surveys occurred over 2 to 3 days as they were conducted in conjunction with baseline bat monitoring. Surveys during the fall migration were conducted exactly as indicated during the spring migration (see Section 2.2); however, prior to the start of fall migration surveys the proponent indicated that most turbines would be placed in the northeast corner of the study area. As a result, some survey locations were refined in order to focus on the area of likely turbine placement. Changes made were

- RPC04 replaced with RPC08
- RPC05 replaced with RPC06
- Vista Survey 03 moved to Bat Monitoring Station 02 (all locations shown in Figure 3.4).

Results from Baseline Investigation

Roadside Point Counts

Observations during RPCs were once again dominated by landbirds (~83% of observations; Table 3.17, with blackbird species (including European Starling), making up approximately 65% of all birds observed (Table 3.17). These observations are consistent with agricultural environments in southern Ontario. Many flocks of ring-billed gulls (~14% of total observations) were also commonly observed moving north-northeast across the study area during the last visit, presumably moving from

rafting locations on the lake to daytime foraging grounds. These large numbers of gulls, in conjunction with the ever-increasing abundance of blackbirds within the study area during this time explains why there was nearly twice as much activity recorded during the visit on October 30 as during previous visits.

Table 3.17 Species Composition of Birds Observed During Fall 2008 Roadside Point Counts

Species	Number by Date				
	08/20	09/04	10/02	10/30	Total # (% of Total)
Landbirds					**1747 (82.5%)**
Mourning Dove	6	8	5	2	21 (1.0%)
Rock Pigeon		10			10 (0.5%)
Northern Flicker	1			1	2 (0.1%)
Bank Swallow	1				1 (0.1%)
Barn Swallow	1		1		2 (0.1%)
Blue Jay	2		81	14	97 (4.6%)
American Crow	9	10	19	7	45 (2.1%)
Horned Lark			9	4	13 (0.6%)
American Robin	4	1	7	22	34 (1.6%)
Gray Catbird		2			2 (0.1%)
European Starling	56	7	129	266	458 (21.6%)
Northern Cardinal	5	1			6 (0.3%)
Indigo Bunting	1				1 (0.1%)
Song Sparrow	9	4			13 (0.6%)
Chipping Sparrow	2				2 (0.1%)
Savannah Sparrow	1	3	8		12 (0.6%)
Blackbird Sp.	179	350	120	237	886 (41.8%)
Common Grackle			21		21 (1.0%)
Red-winged Blackbird	7	1	2		10 (0.5%)
House Finch			2	1	3 (0.1%)
American Goldfinch	17	3	4	49	73 (3.5%)
House Sparrow		20	10	5	35 (1.7%)
Owls					**0 (0%)**
Raptors					**24 (1.1%)**
Northern Harrier				1	1 (0.1%)
Red-tailed Hawk			1	1	2 (0.1%)
Turkey Vulture			17		17 (0.8%)
American Kestrel			3		3 (0.1%)
Merlin	1				1 (0.1%)
Shorebirds					**12 (0.6%)**
Killdeer	3	7	1	1	12 (0.6%)
Waterbirds					**285 (13.5%)**
Ring-billed Gull	7		2	276	285 (13.5%)

Species	Number by Date				
	08/20	09/04	10/02	10/30	Total # (% of Total)
Waterfowl					**50 (2.4%)**
Canada Goose			25	25	50 (2.4%)
Total	**312**	**427**	**467**	**912**	**2118 (100%)**

During the fall migration period, blackbirds can form into large flocks numbering into the thousands. These birds will often be seen flying in long chains, commonly described as a "river of blackbirds". This is a common occurrence across southern Ontario, and during the late fall, flocks around Long Point Bird Observatory can number into the millions.

The visit on October 2 corresponded with a movement of Blue Jays (*Cyanocitta cristata*) east to west across the study area, with 81 observed during RPCs. Flocks of Canada Geese (*Branta canadensis*) were also observed within the Project location during the latter half of October, representing a southward movement in this species.

Utilization rates for the fall migration period are provided in Table 3.18. The site with the greatest level of utilization was RPC01, located near the rehabilitated wetland north of the study area. This utilization was heavily influenced by observations on September 4, when ~200 blackbirds were observed moving within the wetland. Elevated utilization rates were also observed at RPC08, where flocks of blackbirds and House Sparrows (*Passer domesticus*) were regularly observed, and at RPC17 (in agricultural land in the centre of the study area) where a large flock of European Starling was observed on October 3.

Within the season, there was no difference between visit with respect to utilization rate. Overall, an average of 0.607 ± 1.352 birds/ha/min were recorded within the study area during the fall migration period, though again this rate is heavily influenced by the observations of large flocks noted in the paragraph above.

Table 3.18 Bird Utilization Rates for the Fall Migration Period

Station	Visit								Site Average
	08/20		09/04		10/02		10/30		
	# obs.	Utilization Rate	# obs.	Utilization Rate	# obs.	Utilization Rate	# obs.	Utilization Rate	
RPC01	6	0.191	201	6.401	2	0.064	8	0.255	1.728 ± 3.117
RPC06	6	0.191	9	0.287	5	0.159	1	0.032	0.167 ± 0.105
RPC08	7	0.223	63	2.006	35	1.115	20	0.637	0.995 ± 0.766
RPC09	4	0.127	0	0.000	1	0.032	1	0.032	0.048 ± 0.055
RPC12	6	0.191	1	0.032	30	0.955	1	0.032	0.303 ± 0.442
RPC15	5	0.159	0	0.000	7	0.223	2	0.064	0.111 ± 0.099
RPC17	6	0.191	0	0.000	107	3.408	0	0.000	0.900 ± 1.674
Visit Average	5.7 ± 1.0	0.182 ± 0.030	39.1 ± 75.0	1.247 ± 2.388	26.7 ± 38.0	0.851 ± 1.210	4.7 ± 7.3	0.150 ± 0.231	
Season Average	0.607 ± 1.352								

Woodlot Area Searches

As with RPCs, woodlot area searches were dominated by landbirds, at 95% of all observations (see Table 3.19. The most commonly observed species were Blue Jays, blackbird spp., Gray Catbird (*Dumetella carolinensis*) and American Crow (*Corvus brachyrhynchos*). Migrant warblers were observed within the woodlots on September 4 and October 2, 2008. Again several more northerly breeders (such as the Northern Parula and the Yellow-rumped Warbler (*Dendroica coronata*)) were observed, indicating that some migration is occurring through the study area. Though again, the absence of significant numbers indicates that the site is either located on the periphery of a migratory corridor or along a broad-front migration route. The majority of warblers were observed in the larger woodlot in the south of the study area, closest to the Clear Creek Important Bird Area. The large area of forest around the Clear Creek Important Bird Area, and associated woodlands in the vicinity, may represent a minor staging area for migrating passerines.

By the end of October, species and activity levels within the woodlots had fallen to levels that would be expected during the over-wintering period.

Table 3.19 Species Composition of Birds Observed During Fall 2008 Woodlot Area Searches

	Number by Date				
Species	**08/21**	**09/04**	**10/02**	**10/30**	**Total # (% of Total)**
Landbirds					**176 (95.1%)**
Red-bellied Woodpecker		3	3		6 (3.2%)
Downy Woodpecker	2	4	1	2	9 (4.9%)
Hairy Woodpecker			2		2 (1.1%)
Northern Flicker	3				3 (1.6%)
Least Flycatcher		1	1		2 (1.1%)
Eastern Wood-pewee	3	1			4 (2.2%)
Eastern Kingbird			1		1 (0.5%)
Blue Jay	8	3	8	8	27 (14.6%)
American Crow	3	2	5		10 (5.4%)
Black-capped Chickadee		5	4		9 (4.9%)
House Wren		1			1 (0.5%)
Winter Wren			1		1 (0.5%)
Golden-crowned Kinglet			3		3 (1.6%)
American Robin	6	5	3		14 (7.6%)
Hermit Thrush				4	4 (2.2%)
Wood Thrush	1				1 (0.5%)
Gray Catbird	5	4	1		10 (5.4%)
Cedar Waxwing	2	7			9 (4.9%)
Red-eyed Vireo	1	4			5 (2.7%)
Warbling Vireo		2			2 (1.1%)
American Redstart		3	1		4 (2.2%)
Black-and-white Warbler		1			1 (0.5%)
Black-throated Blue Warbler		3			3 (1.6%)
Black-throated Green Warbler		2			2 (1.1%)
Magnolia Warbler		1			1 (0.5%)
Mourning Warbler			1		1 (0.5%)
Nashville Warbler		1			1 (0.5%)
Northern Parula			1		1 (0.5%)

	Number by Date				
Species	**08/21**	**09/04**	**10/02**	**10/30**	**Total # (% of Total)**
Ovenbird		1			1 (0.5%)
Yellow-rumped Warbler			1		1 (0.5%)
Northern Cardinal		1			1 (0.5%)
Song Sparrow	2		1		3 (1.6%)
Chipping Sparrow	1		1		2 (1.1%)
American Tree Sparrow				1	1 (0.5%)
White-throated Sparrow			5		5 (2.7%)
Blackbird Sp.				17	17 (9.2%)
Common Grackle	4				4 (2.2%)
Baltimore Oriole	1				1 (0.5%)
Purple Finch				1	1 (0.5%)
American Goldfinch		2			2 (1.1%)
Owls					**0 (0%)**
Raptors					**9 (4.9%)**
Northern Harrier			1		1 (0.5%)
Red-tailed Hawk		1	1	1	3 (1.6%)
Turkey Vulture		4	1		5 (2.7%)
Shorebirds					**0 (0%)**
Waterbirds					**0 (0%)**
Waterfowl					**0 (0%)**
Total	**42**	**62**	**47**	**34**	**185 (100%)**

Vista Surveys

As with other surveys during fall migration, vista surveys were dominated by landbirds (~84%; Table 3.20). European Starling and Horned Lark were the two most commonly observed landbirds, while Turkey Vultures were also commonly observed across the study area.

Table 3.20 Species Composition of Birds Observed During Fall 2008 Vista Surveys

	Number by Date				
Species	**08/19-08/21**	**09/03**	**10/02**	**10/30**	**Total # (% of Total)**
Landbirds					**1355 (83.8%)**
Mourning Dove	7	11	18		36 (2.2%)
Rock Pigeon	22				22 (1.4%)
Ruby-throated Hummingbird		1			1 (0.1%)
Northern Flicker			1		1 (0.1%)
Swallow sp.	10				10 (0.6%)
Bank Swallow	6	2			8 (0.5%)
Barn Swallow	5	2			7 (0.4%)
Tree Swallow			7		7 (0.4%)
Blue Jay			24		24 (1.5%)
American Crow	3	33	19	7	62 (3.8%)
Horned Lark	2		30	135	167 (10.3%)
American Robin	2	1		3	6 (0.4%)
European Starling	22	9	701	89	821 (50.7%)
Sparrow sp.			20		20 (1.2%)

	Number by Date				
Species	**08/19-08/21**	**09/03**	**10/02**	**10/30**	**Total # (% of Total)**
Song Sparrow	1				1 (0.1%)
Chipping Sparrow	2				2 (0.1%)
Blackbird Sp.		51		86	137 (8.5%)
Common Grackle			1		1 (0.1%)
Baltimore Oriole		2			2 (0.1%)
American Goldfinch	3	6	1		10 (0.6%)
House Sparrow	5	5			10 (0.6%)
Owls					**0 (0%)**
Raptors					**172 (10.6%)**
Northern Harrier		1	7	1	9 (0.6%)
Red-tailed Hawk	1	3		4	8 (0.5%)
Turkey Vulture	32	35	67	10	144 (8.9%)
American Kestrel		1	10		11 (0.7%)
Shorebirds					**7 (0.4%)**
Killdeer			1	6	7 (0.4%)
Waterbirds					**84 (5.2%)**
Great Blue Heron				1	1 (0.1%)
Ring-billed Gull	19	52		12	83 (5.1%)
Waterfowl					**0 (0%)**
Total	**142**	**215**	**907**	**354**	**1618 (100%)**

Several hundred more birds were observed on October 2 than during any other visit, corresponding to a large number of European Starlings (~700 in flocks ranging from 50 to 350 individuals birds) found within the study area. The majority of this activity was centered around the western portion of the study area, with two very large flocks (one of 200, the other of 350) noted. Larger numbers of Northern Harrier and American Kestrel (*Falco sparverius*) on October 2 corresponded with a single individual or a pair of birds making several passes across the survey site.

An analysis of flight heights of the various species guild found that greater than 90% of landbirds and shorebirds (Killdeer) were observed below the risk zone (Figure 3.9). All waterfowl (two flocks of Canada Geese) and the majority of raptors were observed to be moving across the study area within the risk zone, while waterbirds were found mostly either within or above the risk zone.

Fall Migration Summary

Landbirds were once more the dominant species recorded within the study area, dominated by large blackbird flocks that are commonly observed in southern Ontario at this time of year. Other movements of waterfowl and Blue Jays corresponding with broad-front migrations were also noted at various points during the visits. A large flock of Turkey Vultures was also recorded passing the study area on a migration push in early October. Results from fall migration are consistent with those that would be expected for the region, where migration occurs along a broad-front in this portion of the

province. Concentrated movements of birds in this area are predominantly restricted to the north shore of Lake Erie, where a known raptor migration corridor, discussed previously, exists.

Activity within woodlots of the study area is similar to the reverse of that which was observed during the spring. Resident species were observed in late August, while an influx of migrants was noted from September through early October (though not in significant numbers), with activity declined to over-wintering levels by the end of October.

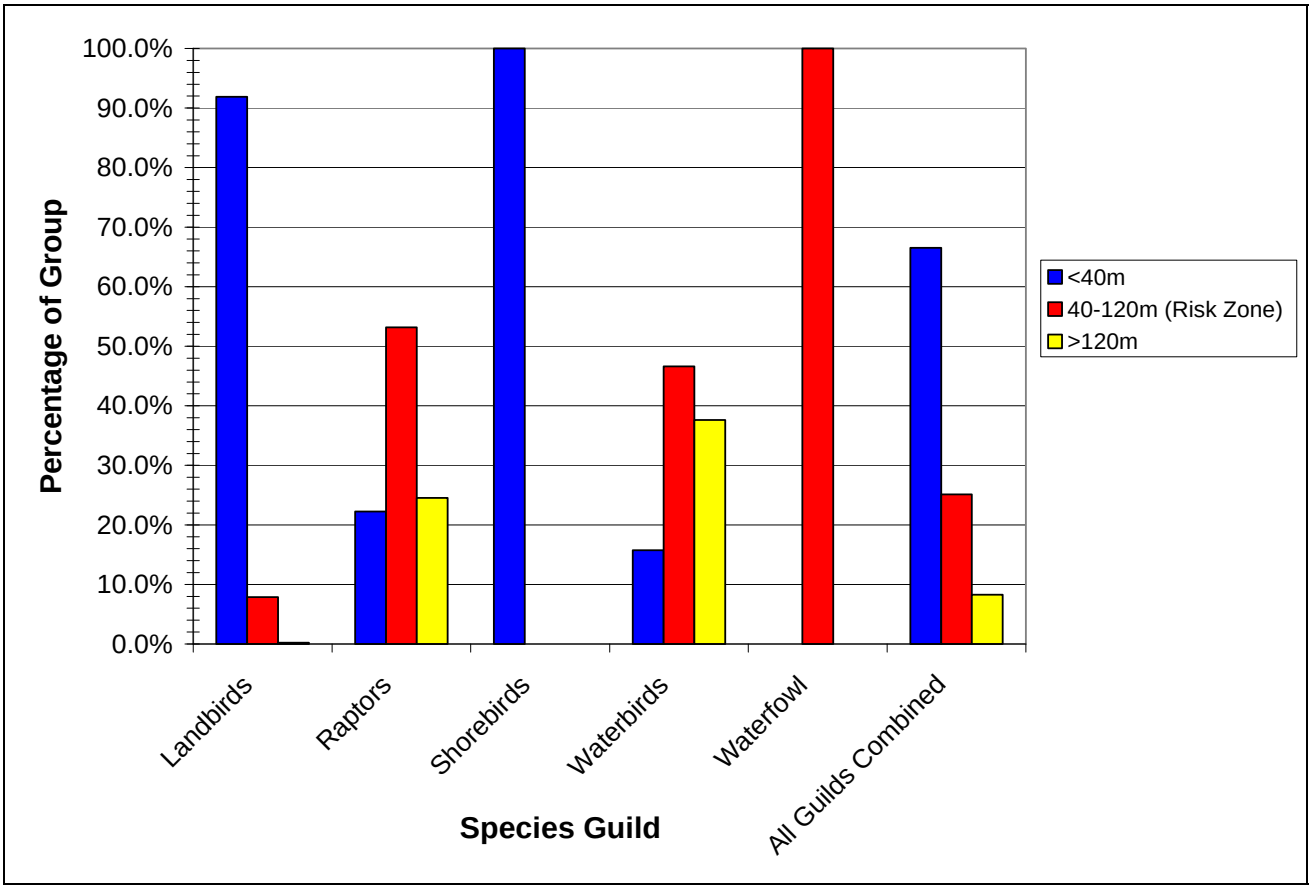


Figure 3.9 Distribution of Bird Flight Heights Observed During Vista Surveys in Fall 2008 by Species Guild

No significant wildlife habitats were identified during baseline fall migration monitoring within the study area.

Though not observed during bird surveys, two Common Nighthawks, a species identified as Threatened by COSEWIC, were observed flying straight southeast toward the lake across the northeastern portion of the study area on August 18, 2008. These birds were moving within the risk zone. No Common Nighthawk were observed during any other visit to the site. This observation likely represents a movement of migrants across the study area, however the low numbers observed

(an observer was regularly on-site during the evening periods for the month of August for bat monitoring) likely suggests that this is a relatively rare occurrence.

Of the 28 priority species identified for BCR 13 that were considered to potentially occur within the study area (see Table 3.3), 10 (including the Common Nighthawks discussed above) were recorded within the study area during baseline investigations. These species were as follows:

• Northern Harrier	• American Kestrel	• Northern Flicker
• Eastern Wood-Pewee	• Eastern Kingbird	• Wood Thrush
• Savannah Sparrow	• Baltimore Oriole	• Bank Swallow

Numbers of these individuals were low within the study area (predominantly <1% of total observations), with the exception of Northern Flickers (1.6% of birds observed in woodlots) and Eastern Wood-pewee (2.2% of birds observed in woodlots). Populations of all these species are considered to be secure or apparently secure within both Ontario and Canada.

As previously discussed, the only large number of raptors observed was a flight of Turkey Vultures travelling southwest across the northern extent of the study area in early October. No other major movements of raptors were noted suggesting that the bulk of raptor movement is restricted to the shoreline of the lake.

As during spring, no plovers were observed within the study area. Again, this suggests that the bulk of plover staging is restricted to the fields around Rondeau, and is not occurring within the study area.

3.3.3.2.4 Over-wintering

Background Information and Methods

There are no Christmas Bird Count stations which overlap the study area, and as a result there is an absence of baseline information relating to over-wintering birds of the study area. Though Christmas Bird Counts are available from station in relatively close proximity (Blenheim and West Elgin), these stations contain a wide range of habitats, including Lake Erie shorelines, and would not be representative of the study area.

In order to document over-wintering bird use of the study area, three surveys were conducted on February 7, February 28 and March 12, 2008. Surveys consisted of a combination of RPCs and area searches of the local woodlots for which permission was obtained. Monitoring locations are shown in Figure 3.6.

RPCs were completed as during summer breeding monitoring (see Section 4.3.3.2.1) between 07:30 and 14:00 EST. Surveys were conducted at 20 points along the roadside in representative habitats, with the starting location determined randomly.

Following point counts, random area searches of the three woodlots were conducted, with searches lasting between 20 and 45 minutes depending on the size of the woodlot and level of activity.

Results of Baseline Investigations

Roadside Point Counts

As would be expected for an agricultural environment in southern Ontario in winter, observations during RPCs were dominated by landbirds (>98%) of observations (Table 3.21), with Horned Lark, European Starling, and Snow Buntings (*Plectrophenax nivalis*), representing greater than 75% of all observations (Table 3.21). These three species were often observed in flocks ranging from 5 to 50 birds.

Table 3.21 Species Composition of Birds Observed During Winter 2008 Roadside Point Counts

	Number by Date			
Species	**02/07**	**02/28**	**03/12**	**Total # (% of Total)**
Landbirds				**1084 (98.5%)**
Mourning Dove	33	22	5	60 (5.5%)
Rock Pigeon			8	8 (0.7%)
Red-bellied Woodpecker		1	2	3 (0.3%)
Blue Jay	1		11	12 (1.1%)
American Crow	18	15	27	60 (5.5%)
Horned Lark	146	104	114	364 (33.1%)
Black-capped Chickadee		1		1 (0.1%)
European Starling	50	6	256	312 (28.3%)
Northern Cardinal		4	9	13 (1.2%)
Dark-eyed Junco		1		1 (0.1%)
Song Sparrow		2		2 (0.2%)
American Tree Sparrow	2	5	1	8 (0.7%)
Common Redpoll	1			1 (0.1%)
American Goldfinch		1		1 (0.1%)
Snow Bunting	140	39	2	181 (16.4%)
House Sparrow	10	41	6	57 (5.2%)
Owls				**0 (0%)**
Raptors				**16 (1.4%)**
Cooper's Hawk	2			2 (0.2%)
Northern Harrier	3	2		5 (0.5%)
Red-tailed Hawk	4	2	2	8 (0.7%)
Sharp-shinned Hawk	1			1 (0.1%)
Shorebirds				**0 (0%)**
Waterbirds				**1 (0.1%)**
Ring-billed Gull		1		1(0.1%)
Waterfowl				**0 (0%)**
Total	**411**	**245**	**445**	**1101 (100%)**

As would be expected, species diversity during the winter was reduced when compared with other seasons. Though four different raptor species were observed during over-wintering surveys, the composition of the raptor community should be expected to be variable from year to year based on availability of prey and weather conditions.

Fewer observations were made during the second winter visit, corresponding with the lowest recorded temperatures during winter observations (-1 to -5°C during Visits 1 and 3, vs. -9 to -13°C during Visit 2; see Appendix C).

Utilization rates for RPC during the over-wintering period are provided in Table 3.22. The site with the greatest level of utilization was RPC10. Observations at this station, located in agricultural lands near the eastern edge of the Project location, recorded several large flocks (up to 40 birds) of Horned Larks and Snow Buntings during the over-wintering period. Flocks of these birds were also observed at several other stations within the Project location (see results provided in Appendix C).

Within the season, there appeared to be little difference based on utilization rates between visits. Overall, an average of 0.370 ± 0.539 birds/ha/min was recorded within the study area during the over-wintering period.

Table 3.22 Bird Utilization Rates for the 2008 Over-wintering Period

Station	Date						Site Average
	02/07		02/28		03/12		
	# obs.	Utilization Rate	# obs.	Utilization Rate	# obs.	Utilization Rate	
RPC01	0	0.000	43	1.369	2	0.064	0.478 ± 0.773
RPC02	24	0.764	3	0.096	16	0.510	0.456 ± 0.338
RPC03	30	0.955	4	0.127	7	0.223	0.435 ± 0.453
RPC04	0	0.000	1	0.032	4	0.127	0.053 ± 0.066
RPC05	30	0.955	10	0.318	6	0.191	0.488 ± 0.409
RPC06	1	0.032	4	0.127	43	1.369	0.510 ± 0.746
RPC07	11	0.350	5	0.159	1	0.032	0.180 ± 0.160
RPC08	0	0.000	42	1.338	25	0.796	0.711 ± 0.673
RPC09	50	1.592	6	0.191	6	0.191	0.658 ± 0.809
RPC10	87	2.771	2	0.064	48	1.529	1.454 ± 1.355
RPC11	33	1.051	4	0.127	5	0.159	0.446 ± 0.524
RPC12	0	0.000	2	0.064	5	0.159	0.074 ± 0.080
RPC13	0	0.000	0	0.000	9	0.287	0.096 ± 0.165
RPC14	2	0.064	10	0.318	0	0.000	0.127 ± 0.169
RPC15	1	0.032	4	0.127	3	0.096	0.085 ± 0.049
RPC16	0	0.000	30	0.955	5	0.159	0.372 ± 0.512
RPC17	24	0.764	1	0.032	5	0.159	0.318 ± 0.391
RPC19	0	0.000	0	0.000	21	0.669	0.223 ± 0.386
RPC20	4	0.127	6	0.191	5	0.159	0.159 ± 0.032
RPC21	1	0.032	2	0.064	4	0.127	0.074 ± 0.049
Visit Average	14.9 ± 22.7	0.475 ± 0.724	9.0 ± 13.2	0.285 ± 0.419	11.0 ± 13.4	0.350 ± 0.428	
Season Average	0.370 ± 0.539						

Woodlot Area Searches

Activity within and around woodlots of the study area was greatly reduced during the winter period. Again, common winter birds dominated observations, with landbirds making up around 80% of observations (Table 3.23). The notable exception was a juvenile Golden Eagle (*Aquila chrysaetos*), which was observed perched within the southernmost woodlot on February 28, 2008. Upon entering the woodlot, the eagle departed and was mobbed by a Red-tailed Hawk (*Buteo jamaicensis*). This observation is outside of the recognized wintering area for this species, and likely represents early migration movements. It is not expected that Golden Eagles would be regularly observed in this location. No Golden Eagles were observed in any other winter visit.

Table 3.23 Species Composition of Birds Observed During Winter 2008 Woodlot Area Searches

	Number by Date			
Species	**02/07**	**02/28**	**03/12**	**Total # (% of Total)**
Landbirds				**25 (80.6%)**
Hairy Woodpecker			2	2 (6.5%)
Downy Woodpecker	1	2	2	5 (16.1%)
Red-bellied Woodpecker			1	1 (3.2%)
American Crow		3	2	5 (16.1%)
Black-capped Chickadee			2	2 (6.5%)
Red-breasted Nuthatch	1			1 (3.2%)
Northern Cardinal	1			1 (3.2%)
Dark-eyed Junco	3			3 (9.7%)
American Tree Sparrow	5			5 (16.1%)
Owls				**0 (0%)**
Raptors				**6 (19.3%)**
Red-tailed Hawk		3	2	5 (16.1%)
Golden Eagle		1		1 (3.2%)
Shorebirds				**0 (0%)**
Waterbirds				**0 (0%)**
Waterfowl				**0 (0%)**
Total	**11**	**9**	**11**	**31 (100%)**

Over-Wintering Birds Summary

Overall, observations during the over-wintering period were typical for the area; being dominated by flocks of landbirds (Horned Larks, European Starlings) observed on the agricultural fields. Horned Larks and European Starlings formed the largest component of the over-wintering community. Activity within woodlots was extremely low during this period, which is not to be unexpected given the absence of forage in this habitat in winter. Woodpeckers formed the greatest component of the

woodlot community, with other common winter species such as nuthatches and chickadees observed.

Several raptors were observed within the study area during the winter, with Red-tailed Hawks forming the dominant component. The composition of the local raptor community would be expected to vary year to year, in conjunction with population fluctuations in prey populations, with the exception that Red-tailed Hawks are anticipated to always form a primary component of the local population.

No significant wildlife habitat was noted within the study area during over-wintering bird monitoring.

As previously discussed, the single Golden Eagle (a provincially endangered species) observed within the study area is considered to be a casual passage migrant, and this species is not expected to be regularly observed within the study area.

Of the 28 priority species identified for BCR 13 that were considered to potentially occur within the study area (see Table 3.3), only one was observed within the study area during the over-wintering period; Northern Harrier (*Circus cyaneus*). This species was not regularly observed during over-wintering monitoring, and is considered to have a secure population within the province.

3.3.3.3 Mammals

The *Atlas of the Mammals of Ontario* lists 37 species that occur within the region of the study area (Dobbyn 1994). A list of these species is provided in Table 3.24.

Table 3.24 Mammals Potentially Occurring within the Study Area and their Conservation Status[1]

Species		Conservation Status[2]						Observed[9]
Common Name	Scientific Name	Ontario			Canada			
		SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	
Opossums								
Virginia Opossum	*Didelphis virginiana*	S4			N4			√
Shrews and Moles								
Common Shrew	*Sorex cinereus*	S5			N5			
Northern Short-tailed Shrew	*Blarina brevicauda*	S5			N5			
Star-nosed Mole	*Condylura cristata*	S5			N5			
Bats								
Small-footed bat	*Myotis leibii*	S2S3			N2N3			√
Little Brown Bat	*Myotis lucifuga*	S5			N5			√
Northern Long-eared Bat	*Myotis septentrionalis*	S3?			N4			√
Silver-haired Bat	*Lasionycteris noctivagans*	S4			N5			√
Eastern Pipistrelle	*Pipistrellus subflavans*	S3?			N4N5			√
Big Brown Bat	*Epstesicus fuscus*	S5			N5			√
Eastern Red Bat	*Lasiurus borealis*	S4			N4N5			√
Hoary Bat	*Lasiurus cinereus*	S4			N5			√
Rabbits and Hares								
Eastern Cottontail	*Sylvilagus floridanus*	S5			N5			√
European Hare	*Lepus europeanus*	SE			NE			

Species		Conservation Status[2]						Observed[9]
Common Name	Scientific Name	Ontario			Canada			
		SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	
Rodents								
Eastern Chipmunk	*Tamias striatus*	S5			N5			√
Woodchuck	*Marmota monax*	S5			N5			
Grey Squirrel	*Sciurus carolinensis*	S5			N5			√
Red Squirrel	*Tamiasciurus hudsonicus*	S5			N5			
Southern Flying Squirrel	*Glaucomys volans*	S4	NAR		N4	NAR		
Beaver	*Castor canadensis*	S5			N5			
White-footed Mouse	*Peromyscus leucopus*	S5			N5			
Deer Mouse	*Peromyscus maniculatus*	S5			N5			
Meadow Vole	*Microtus pennsylvanicus*	S5			N5			
Muskrat	*Ondatra zibethicus*	S5			N5			√
Norway Rat	*Rattus norvegicus*	SE			NE			
House Mouse	*Mus musculus*	SE			NE			
Meadow Jumping Mouse	*Zapus hudsonius*	S5			N5			
Porcupine	*Erethizon dorsatum*	S5			N5			
Carnivores								
Coyote	*Canis latrans*	S5			N5			
Red Fox	*Vulpes vulpes*	S5			N5			
Raccoon	*Procyon lotor*	S5			N5			√
Ermine	*Mustela erminea*	S5			N5			
Long-tailed Weasel	*Mustela frenata*	S4			N5			
Mink	*Mustela vison*	S5			N5			
American Badger	*Taxidea taxus*	S2	END	END	N4N5	END	END	
Striped Skunk	*Mephitis mephitis*	S5			N5			√
Ungulates								
White-tailed Deer	*Odocoileus virginianus*	S5			N5			√

1 Based on Range Maps provided in Dobbyn, 1994.
2 Accessed from NHIC, 2008b
3 SRANK = Provincial Status; S = Sub-national Rank (Ontario), E = Exotic species, 2 = Imperilled, 3 = Vulnerable, 4 = Apparently Secure, 5 = Secure, ? = Rank Uncertain
4 COSSARO = Committee on the Status of Species at Risk in Ontario; NAR = Not at Risk, SC = Special Concern, END = Endangered
5 ESA = Ontario Endangered Species Act, 2007; END = Endangered
6 NRANK = National Status (NatureServe (www.natureserve.org), in conjunction with Conservation Data Centres, such as NHIC); N = National Rank; E = Exotic species; 2 = Imperilled, 3 = Vulnerable, 4 = Apparently Secure; 5 = Secure
7 COSEWIC = Committee on the Status of Endangered Wildlife in Canada; NAR = Not at Risk, SC = Special Concern, END = Endangered
8 SARA = Species at Risk Act – Canada; NAR = Not at Risk, SC (3) = Special Concern on Schedule 3, END = Endangered on Schedule 1
9 During 2008 site visits

Mammals that are expected to occur in the study area include White-tailed Deer (*Odocoileus virginianus*), Muskrat (*Ondatra zibethicus*), Virginia Opossum (*Didelphis virginiana*), Eastern Cottontail (*Sylvilagus floridanus*), Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), Raccoon (*Procyon lotor*), and Striped Skunk (*Mephitis mephitis*). Many other small species, such as mice, squirrels, Eastern Chipmunk (*Tamias striatus*), and shrews are also likely present.

The presence of White-tailed Deer, Virginia Opossum, Grey Squirrel (*Sciurus carolinensis*), Eastern Chipmunk, Striped Skunk, and Raccoon were confirmed during baseline investigations. In addition, several species of bat were recorded within the study area during baseline surveys conducted in the summer of 2008; the results of these surveys are discussed individually below.

Of the mammals expected to occur within the study area, Small-Footed Bat (*Myotis leibii*), Northern Long-eared Bat (*Myotis septentrionalis*), and Eastern Pipistrelle (*Pipistrellus subflavus*) have been identified as having populations which are considered to be vulnerable provincially (NHIC, 2008b). These species are discussed in greater detail below. Further, the American Badger (*Taxidea taxus*) is considered to be a species at risk, and is discussed in Section 3.3.4.3.

3.3.3.3.1 Bats

No bat hibernacula, daytime roosts, or maternity colonies have been identified near or within the study area, however targeted surveys were not conducted to identify these features and it remains possible that some of these features may be present within the study area. No caves, which can serve as hibernacula or roosting sites, are known or expected to occur within the study area.

As is required by the new draft MNR Guidelines for Bats (MNR, 2010) "Bats and Bat Habitats – Guidelines for Wind Power Projects", the potential for bay habitat within 120 m of Project components, shown in Figure 4.1 was considered based on site investigations conducted in 2008. No hollow trees, trees with loose bark, human structures, rock faces, caves, or abandoned mines (all features which can serve as potential bat maternity colonies or hibernacula) were identified within 120 m of Project components.

The Northern Long-eared Bat, provincially listed as vulnerable (this ranking is uncertain due to the sparse information available) but apparently secure nationally (NHIC, 2008b), was recorded during acoustic monitoring within the Project location (see below, 2008 Bat Migration Monitoring). This bat hibernates during winter in mines or caves. During the summer, they prefer to roost in tree cavities, hollow trees or under loose bark, and hunt within forests, below the canopy. It has been found that maternity colonies were most commonly found in mature, shade tolerant deciduous tree stands (MNR, 2000; MNR, 2006). No bat hibernacula, daytime roosts, or maternity colonies of this species are known to occur within or near the study area, however suitable habitat is available.

The Small-footed Bat, listed as provincially and nationally imperilled or vulnerable (NHIC, 2008b) was also recorded during acoustic monitoring within the Project location. Very little is known about the ecology of this species. This bat hibernates during winter in mines or caves and can tolerate lower temperatures and humidity than other bats. Daytime roosts have been observed in buildings and under stones, rock slabs and tree bark, while night roosts are known from caves and buildings. Very little is known about the foraging behaviour of this species. (MNR, 2000; MNR, 2006). As with Northern Long-eared Bat, though no roosts are known to occur within or near the study area, suitable habitat is available.

The Eastern Pipistrelle, provincially listed as vulnerable (this ranking is uncertain due to the sparse information available) but apparently secure nationally (NHIC, 2008b), was recorded during acoustic monitoring within the Project location. Eastern Pipistrelles occurs in southern Ontario, and most commonly roost in foliage, through buildings and hollows of old trees can also be used. In the winter, they hibernate in caves and abandoned mines. They usually forage over watercourses and open spaces such as clearings and fields; apparently feeding mostly on moths (MNR, 2000; MNR, 2006). As with the other bat species, though no roosts are known to occur within or near the study area, suitable habitat is available.

2008 Bat Migration Monitoring

Methodology

Based on the *Guideline to Assist in the Review of Wind Power Proposals: potential impacts to Bats and Bat Habitats* (MNR, 2007b), and discussions with the local MNR office (Simpson, 2008), the study area of the Gesner Wind Power Development is considered to be a low sensitivity site as follows:

- the site is > 5 km from a major shoreline
- the site is no located on a forested ridge habitat or landscape level linear habitat feature
- the site is located > 50 km from a known hibernacula or swarming site
- the site is located > 5 km from potential hibernacula
- forest openings will not be created to accommodate wind turbines.

As the site is a low sensitivity site, 15 nights (sunset to sunrise) of acoustic bat monitoring at each of 2 to 3 stations are required through the month of August.

Prior to the commencement of baseline monitoring, three survey stations were identified within the Project location (shown in Figure 3.6). Station locations were selected to ensure surveys were spatially distributed throughout the area where turbines may be deployed. Surveys were placed in agricultural fields, two in harvested hay fields (Sites 2 and 3) and one in the middle of a corn field (Site 1).

Surveys were conducted from August 2 through September 9, 2008. Surveys had to be extended into September as a result of weather conditions at the site that restricted monitoring on some occasions (i.e., periods of significant rain).

An array of four electret ultrasound microphones (manufactured by Avisoft; see www.avisoft.com) were deployed 4 m above the ground on a telescoping light stand. Microphones were deployed at 90-deg angles from each other in order to ensure adequate coverage of the study site. Microphones were then connected to an Avisoft Ultrasound Gate 416-200, which converts all input signals from analog to digital and outputs, then to a laptop running Avisoft RECORDER Version 3.3 (a multi-channel triggering hard-disk recording software program).

Each evening, two stations were monitored, with units deployed prior to the start of bat movements within the area (at or within a half-hour of sunset). Recordings were made continuously until sunrise or the hard disk was full (1 to 2 hours before sunrise), with files saved in 1 or 2 minute lengths. Weather conditions at the time of deployment were noted. Weather conditions were favourable during the monitoring period (no rain, low wind, temperatures greater than 10°C); however,

occasionally rainstorms would pass through the study area which would require equipment to be removed while the rains occurred.

Recordings were then analyzed in the lab using Avisoft-SASLab Pro, Version 4.40, to determine the number of bat passes that were observed (as number of bats cannot be determined from acoustic monitoring), to classify observed calls by species and to document occurrences of feeding buzzes (where a bat increases the frequency of its calling in an attempt to pinpoint the location of a potential prey). Big Brown Bats (*Epstesicus fucus*) and Silver-haired Bats (*Lasionycteris noctivagans*) cannot be distinguished from each other through analysis of acoustic recordings, so observations of these species are grouped together (MNR, 2006).

In addition to the acoustic monitoring program, 45 minutes of spotlighting was completed at each station monitored that evening during the first 2 hours following sunset. Though not used to quantify bat numbers, this information is useful in aiding in interpretation of acoustic monitoring results and are discussed, where relevant, in the report below.

Results

Over the 45 nights of monitoring, several thousand bat passes were recorded within the study area.

Species Composition

All eight species of bat known to reside in the province were recorded within the study area. Observations at all sites were dominated by the combined group of Big Brown Bat/Silver-haired Bat, which as previously mentioned, cannot be distinguished based on auditory calls alone (Table 3.25 and Figure 3.10). This combined group represented, on average, greater than 45% of all bat passes recorded at all sites (Figure 3.10). Differences between other groups were negligible, with no real observable difference between groups or sites. The species with the lowest representation for the monitoring period was Eastern Pipistrelle (Figure 3.10).

Table 3.25 Average Bat Activity for the Entire Monitoring Period by Species and Site

Species		Average Passes / Hour [± Standard Deviation (SD)]		
Common Name	**Scientific Name**	**Site 1**	**Site 2**	**Site 3**
Big Brown Bat / Silver-haired Bat	*Eptesicus fuscus / Lasionycteris noctivagans*	5.3 ± 3.0	19.3 ± 17.4	5.5 ± 6.0
Eastern Red Bat	*Lasiurus borealis*	0.3 ± 0.4	1.1 ± 1.8	0.2 ± 0.2
Hoary Bat	*Lasiurus cinereus*	1.0 ± 1.2	1.6 ± 1.3	1.1 ± 1.0
Eastern Small-footed Bat	*Myotis leibii*	0.5 ± 1.4	1.4 ± 1.5	0.3 ± 0.5
Little Brown Bat	*Myotis lucifugus*	1.1 ± 1.7	4.8 ± 7.5	0.6 ± 0.5
Northern Long-eared Bat	*Myotis septentrionalis*	0.7 ± 1.4	1.7 ± 3.6	2.0 ± 4.8
Unknown *Myotis* sp.	*Myotis sp.*	1.3 ± 2.9	4.8 ± 6.4	1.0 ± 1.6
Eastern Pipistrelle	*Pipistrellus subflavus*	0.1 ± 0.2	0.4 ± 0.4	0.1 ± 0.2
Unknown sp.		0.2 ± 0.4	0.1 ± 0.2	0.1 ± 0.1

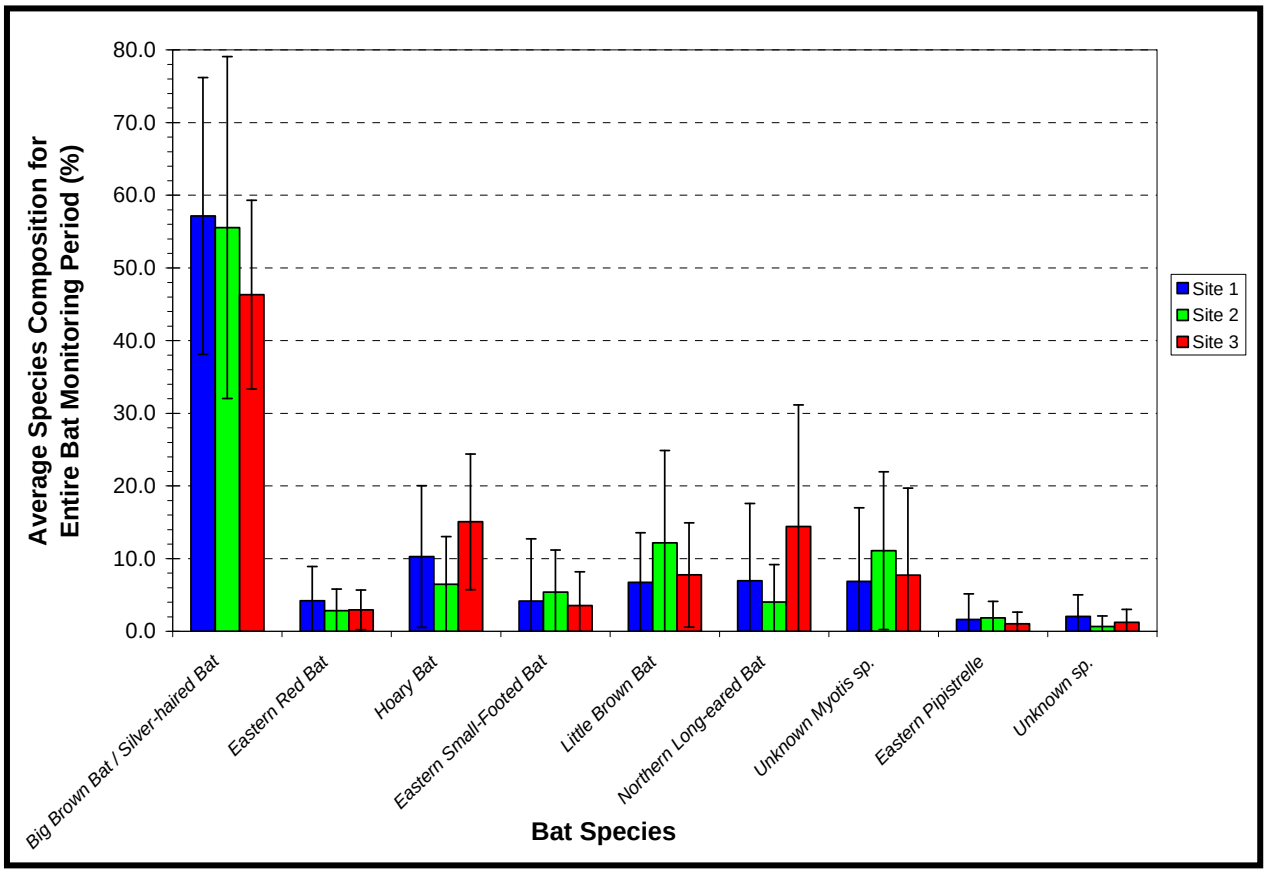


Figure 3.10 Average Species Composition of Bats (±SD) by Site for the Entire Monitoring Period

The Big Brown Bat is considered to be common across southern Canada. Big Brown Bats emerge at dusk for feeding and are considered to be habitat generalists when foraging. The bats ear a wide variety of insects. Some evidence suggests that these bats are more apt to forage in open areas, which would be consistent with their increased proportions within the study area. (MNR, 2006). The Silver-haired Bat is also widespread in southern Ontario during the summer months, where they are most commonly found in forests. Based on known habitat associations of these species, this suggests that observations within the Project location of this combined group are likely predominated by Big Brown Bat, with their preference for open sites.

The relatively even composition of other species recorded within the Project location is suggestive of the diverse array of habitats found within this portion of the province (from wetlands, to forests, to agricultural and urban environments). Observations of forest specialists within the agricultural fields are likely individuals moving between small isolated forest patches on foraging bouts.

Date

Bat passes per hour were averaged for the entire night of monitoring, and are provided in Table 3.26 (and graphically in Figure 3.11). Peak activity at Site 1 occurred on August 3, August 18 at Site 2,

and August 29 at Site 3. No underlying trend was evident with respect to date, with the exception that activity levels were low (average of 5 bat passes per hour or less) across all sites in September. Bat activity is expected to be lower during this period as insect abundance drops with the onset of colder weather and migratory species have, or are moving to wintering sites.

Table 3.26 Bat Activity (average bat passes per hour) at Each Survey Site by Date

Date	Bat Activity (average passes per hour)		
	Site 1	Site 2	Site 3
August 2	6.29	32.34	
August 3	17.49		16.91
August 5		28.97	14.07
August 6	37.99*	58.93*	
August 7	4.87	48.83	
August 8	4.37		4.06
August 9		6.32*	
August 10		7.99	1.48
August 11	10.45*		3.47
August 12		56.36	14.08
August 13	16.68	21.73	
August 14	8.05		5.27
August 15		70.37	2.91
August 18	11.55	70.97	
August 19	6.15		5.71
August 20		17.07	8.91
August 21	13.50		
August 25		52.13	4.78
August 26	10.42	65.40	
August 27	11.53*		47.30*
August 28	4.29		14.19
August 29		17.84	25.25
September 3	1.68	3.90	
September 7	4.95		5.44
September 9		3.81	0.89
Average (±SD)	*8.48 ± 4.86*	*35.55 ± 24.67*	*8.50 ± 6.92*

* Dates where partial nights were obtained due to weather constraints, and are thus excluded from the calculation of the average.

If we consider those dates where high amounts of bat activity[1] were noted, elevated levels of activity were noted on one occasion at Site 3, and several at Site 2. The single observation of increased activity at Site 3 occurred on August 29, where an average of 25.25 bat passes per hour were noted. This movement corresponded to an elevated abundance of Big Brown Bat/Silver-haired Bat through the area during the early part of the evening.

Big Brown Bat/Silver-haired Bat were predominant when elevated levels of movement were noted at Site 2 on several dates (see Table 3.26); however, abundance of this group had decreased by the second half of August. Elevated bat abundances in the latter half of August (August 25 and 26) correspond with a large number of Little Brown Bats during the early and later parts of the evening. Based on limited data available from spotlighting, it is suggestive that these elevated observations at

[1] i.e., bat activity was greater than 20 bat passes/hour as based on interpretation of data presented in Figure 3.11, activity levels can fluctuate regularly up to this mark

Site 2 are the result of one or two bats making repeated foraging passes around the weeping willow tree. Little Brown Bats are considered to be the most common species in Canada and are found throughout Ontario (MNR, 2006).

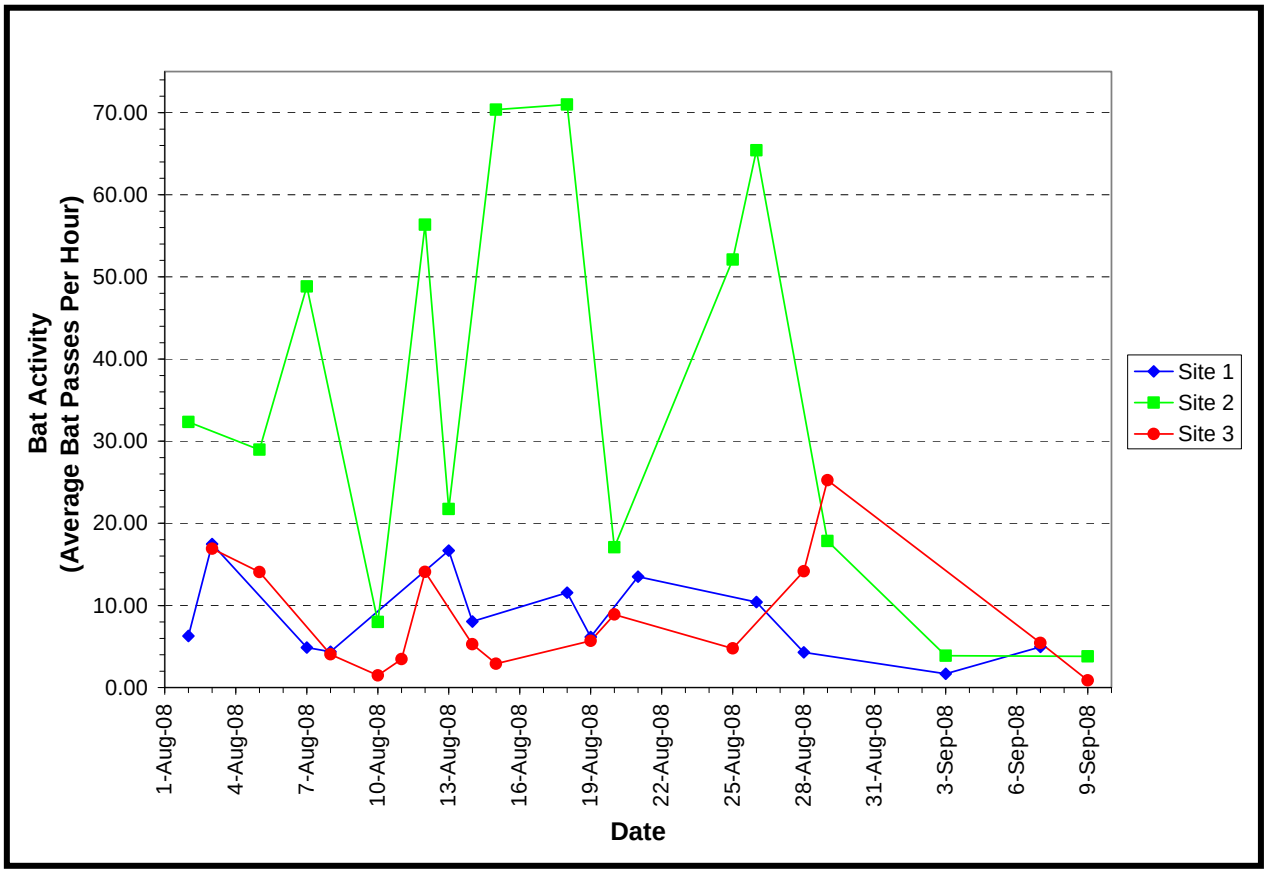


Figure 3.11 Bat Activity by Date for Each Survey Site

Hours Past Sunset

Bat passes per hour were averaged for all nights at a site across each hour past sunset to determine levels of activity (Figure 3.12). Bat activity was greatest within the first 2 hours past sunset, averaging around 25 passes per hour at Sites 1 and 3, and 115 passes per hour at Site 2. Activity then decreased rapidly to plateau around 5 to 10 passes per hour between 5 and 9 hours past sunset before tailing off to 0 for the remainder of the night.

This pattern of activity in an evening corresponds with known bat movements; bats often emerge to feed within the first few hours following sunset, which coincides with a peak in the activity of invertebrates. Activity then tends to drop as temperatures and invertebrate activity lowers in the middle of the night, with bats retiring to night roosts. An increase in bat activity just before dawn is also usually noted before bats return to their day roosts, however this was not observed at this site. (MNR, 2006). This may be suggestive of the absence of suitable day roosts within the Project location; however, this cannot be confirmed based on the available information.

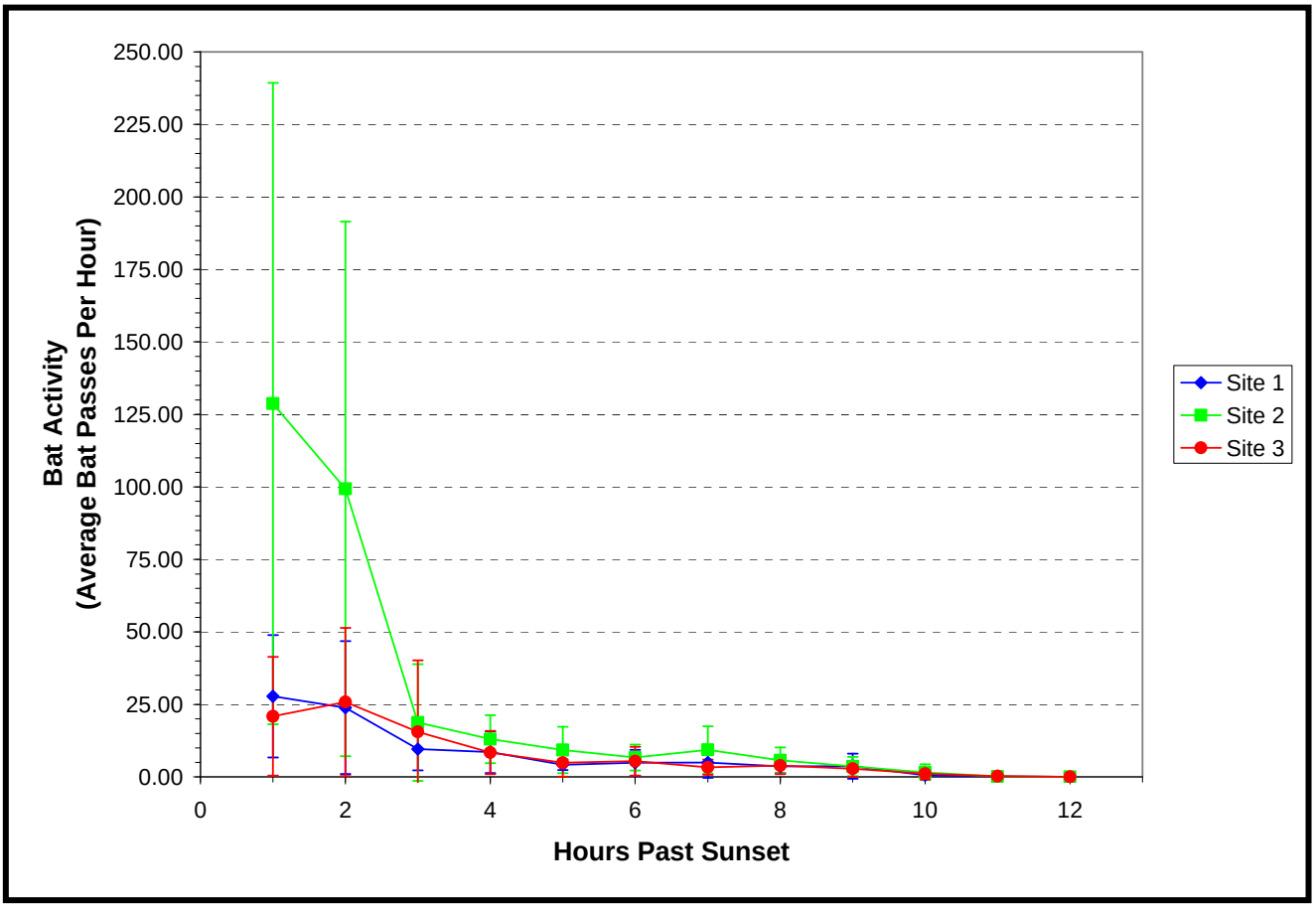


Figure 3.12 Bat Activity (±SD) by Hours Past Sunset for Each Survey Site

Feeding Buzzes

Feeding buzzes occur when bats alter the timing and frequency of their ultrasonic calls (which are fairly consistent and evenly spaced) to a rapid series of calls to zero-in on the location of a specific prey (see Figure 3.13).

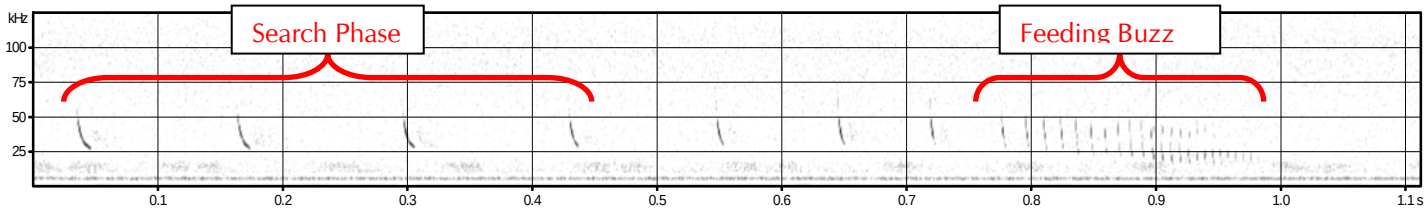


Figure 3.13 Sonogram of Search Phase and Feeding Buzz from Big Brown Bat/Silver-haired Bat

Feeding buzzes were recorded at all sites during baseline investigations (Table 3.27). The majority, both numerically and proportionately, were recorded at Site 2, where visual observations during spotlighting noted several bats making repeated foraging passes on swarms of insects present around the weeping willow tree and other shrubs in this location. Several foraging passes were also observed during spot-lighting along the roadway between the cornfields at Site 1; correspondingly, the second highest number of feeding buzzes was recorded at this location.

Table 3.27 Feeding Buzzes by Date and Site

Date	Feeding Buzzes					
	Site 1		Site 2		Site 3	
	Number	Proportion of All Calls	Number	Proportion of All Calls	Number	Proportion of All Calls
August 2	1	3.03	36	11.84		
August 3	6	3.75			3	1.89
August 5			17	6.34	4	3.01
August 6	5	2.73	21	7.61		
August 7	2	6.45	11	2.74		
August 8	1	2.38			0	0.00
August 9			0	0.00		
August 10			7	9.09	0	0.00
August 11	0	0.00			0	0.00
August 12			53	9.78	1	0.72
August 13	3	1.83	4	1.88		
August 14	1	1.27			0	0.00
August 15			20	3.13	0	0.00
August 18	1	1.02	27	4.80		
August 19	1	1.61			0	0.00
August 20			0	0.00	3	3.30
August 21	2	1.46				
August 25			9	1.91	2	4.17
August 26	3	3.03	8	1.18		
August 27	2	5.13			2	1.34
August 28	1	2.22			1	0.72
August 29			4	2.50	2	0.75

Date	Feeding Buzzes					
	Site 1		Site 2		Site 3	
	Number	Proportion of All Calls	Number	Proportion of All Calls	Number	Proportion of All Calls
September 3	3	16.67	1	2.94		
September 7	3	5.56			2	4.08
September 9			1	2.38	0	0.00
Average (±SD)	2.2 ± 1.6	3.63 ± 3.89	13.7 ± 14.9	4.26 ± 3.62	1.3 ± 1.3	1.25 ± 1.55

Differences between Stations

Based on the results described above, it is clear that bat activity was much greater at Site 2, when compared with Sites 1 and 3 (Table 3.26 and Figure 3.11). The elevated numbers at this station are the result of a very high number of passes recorded during the first 2 hours after sunset at this location when compared to others (see Figure 3.10). Based on visual observations during night-lighting at this site, a small group of bats (commonly 2 to 4) would make repeated passes of a nearby weeping willow tree and other shrubs. A large swarm of insects was visible in this location, and the bats were seen to move frequently through the swarm. This is also evidenced by the greater number of feeding buzzes at this location (Table 3.27). Outside of this period, there appeared to be no major difference between stations (Figure 3.12).

3.3.3.4 Reptiles and Amphibians

Based on information from Natural Resources Canada's *Amphibians and Reptiles of Ontario* (McKenney et al., 2007), 38 species of reptiles and amphibians may reside within the study area (see Table 3.28).

Though large wetlands are absent from the study area (see Section 4.3.2), the variety of habitats found within the area likely supports a diverse population of amphibians and reptiles. Those that are likely to be found within the study area based on habitat availability include Wood Frog (*Rana sylvatica*), American Toad (*Bufo americanus*), Western Chorus Frog (*Pseudacris triseriata triseriata*), Spring Peeper (*Pseudacris crucifer*), Midland Painted Turtle (*Chrysemys picta marginata*), Eastern Red-backed Salamander (*Plethodon cinereus*), Mudpuppy (*Necturus maculosus*), Yellow-spotted Salamander (*Ambystoma maculatum*), Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Dekay's Brown Snake (*Storeria dekayi*), Eastern Fox Snake (*Elaphe gloydi*), and Eastern Milksnake (*Lampropeltis triangulum*).

Site visits in 2008 confirmed the presence of Western Chorus Frog, Green Frog (*Rana clamitans*), American Toad, Spring Peeper, Wood Frog and American Bullfrog (*Rana castebiana*) within the study area.

Of the reptiles and amphibians that may occur in the study area, several are considered to be VTE species. These include Fowler's Toad (*Bufo fowleri*), Spiny Softshell (*Apalone spinifera*), Spotted Turtle (*Clemmys guttata*), Blanding's Turtle (*Emydoidea blandingi*), Wood Turtle (*Glyptemys insculpta*), Northern Map Turtle (*Graptemys geographica*), Five-lined Skink (*Eumeces fasciatus*), Eastern Fox Snake, Eastern Hog-nosed Snake (*Heterodon platirhinos*), Eastern Milksnake, Queen Snake (*Regina septemvittata*), and Eastern Ribbon Snake (*Thamnophis sauritus*). These species are discussed in Section 3.3.4 – Species at Risk.

Table 3.28 Reptiles and Amphibians Potentially Occurring within the Study Area and their Conservation Status [1]

Species		Conservation Status[2]						Observed[9]
Common Name	Scientific Name	Ontario			Canada			
		SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	
Salamanders								
Mudpuppy	Necturus maculosus	S4	NAR		N4	NAR		
Blue-spotted Salamander	*Ambystoma laterale*	S4			N5			
Yellow-spotted Salamander	*Ambystoma maculatum*	S4			N5			
Four-toed Salamander	Hemidactylium scutatum	S4	NAR		N4	NAR		
Eastern Red-backed Salamander	Plethodon cinereus	S5			N5			
Eastern Newt	*Notophthalmus viridescens*	S5			N5			
Frogs and Toads								
American Toad	*Bufo americanus*	S5			N5			
Fowler's Toad	*Bufo fowleri*	S2	THR	THR	N2	THR	THR	
Gray Treefrog	*Hyla versicolor*	S5			N5			
Spring Peeper	*Pseudacris crucifer*	S5			N5			
Western Chorus Frog	*Pseudacris triseriata triseriata*	S4	NAR		N5	NAR		
American Bullfrog	*Rana castebiana*	S4			N5			
Green Frog	*Rana clamitans*	S5			N5			
Pickerel Frog	*Rana palustris*	S4	NAR		N5	NAR		
Northern Leopard Frog	*Rana pipiens*	S5	NAR		N5	NAR		
Mink Frog	*Rana septentrionalis*	S5			N5			
Wood Frog	*Rana sylvatica*	S5			N5			
Turtles								
Spiny Softshell	*Apalone spinifera*	S3	THR	THR	N2	THR	THR	
Snapping Turtle	*Chelydra serpentina*	S5	SC	SC	N5	SC		
Midland Painted Turtle	Chrysemys picta marginata	S5			N5			
Spotted Turtle	*Clemmys guttata*	Sensitive Species – no ranking provided		END	Sensitive Species – no ranking provided		END	
Blanding's Turtle	Emydoidea blandingi	S3	THR	THR	N4	THR	THR	
Wood Turtle	*Glyptemys insculpta*	Sensitive Species – no ranking provided		END	Sensitive Species – no ranking provided		SC (3)	
Northern Map Turtle	Graptemys geographica	S3	SC	SC	N4	SC	SC	

Species		Conservation Status[2]						Observed[9]
Common Name	Scientific Name	Ontario			Canada			
		SRANK[3]	COSSARO[4]	ESA[5]	NRANK[6]	COSEWIC[7]	SARA[8]	
Eastern Box Turtle	*Terrapene carolina*	SU			NE			
Red-eared Slider	Trachemys scripta elegans	SE			NE			
Lizards								
Five-lined Skink	Eumeces fasciatus	S3	SC	SC	N3	SC	SC (3)	
Snakes								
Northern Ring-necked Snake	Diadophis punctatus edwardsii	S4			N5			
Eastern Foxsnake	Elaphe gloydi	S3	THR	THR	N3	END	THR	
Eastern Hog-nosed Snake	Heterodon platirhinos	S3	THR	THR	N3	THR	THR	
Eastern Milksnake	Lampropeltis triangulum	S3	SC	SC	N5	SC	SC	
Northern Watersnake	Nerodia sipedon sipedon	S5	NAR		N5	NAR		
Smooth Green Snake	*Opheodrys vernalis*	S4			N5			
Queen Snake	Regina septemvittata	S2	THR	THR	N5	THR	THR	
Dekay's Brownsnake	*Storeria dekayi*	S5	NAR		N5	NAR		
Red-bellied Snake	*Storeria occipitomaculata*	S5			N5			
Eastern Ribbonsnake	Thamnophis sauritus	S3	SC	SC	N4	SC	SC	
Eastern Gartersnake	*Thamnophis sirtalis sirtalis*	S5			N5			

1 As determined from potential climatic domain maps in McKenney et al (2007) and range maps provided in Oldham and Weller (2000).

2 Accessed from NHIC, 2008b

3 SRANK = Provincial Status; S = Sub-national Rank (Ontario), 2 = Imperilled, 3 = Vulnerable, 4 = Apparently Secure, 5 = Secure, E = Exotic, U = Unknown

4 COSSARO = Committee on the Status of Species at Risk in Ontario; NAR = Not at Risk, SC = Special Concern, THR = Threatened.

5 ESA = Ontario Endangered Species Act, 2007; SC = Special Concern, THR = Threatened, END = Endangered.

6 NRANK = National Status (NatureServe (www.natureserve.org), in conjunction with Conservation Data Centres, such as NHIC); N = National Rank (Canada), 2 = Imperilled, 3 = Vulnerable, 4 = Apparently Secure, 5 = Secure, E = Exotic,

7 COSEWIC = Committee on the Status of Endangered Wildlife in Canada; NAR = Not at Risk

8 SARA = Species at Risk Act – Canada; SC = Special Concern, THR = Threatened, END = Endangered (on Schedule 1); SC (3) = Special Concern (on Schedule 3)

9 During 2008 site visits

3.3.4 Species at Risk

For the purposes of this report, Species at Risk are considered to be those listed in either the Ontario Endangered Species Act, 2007 (ESA) or the federal Species at Risk Act (SARA), or those that have been designated as Endangered, Threatened, or Special Concern by either the Committee on the Status of Species at Risk in Ontario (COSSARO) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

3.3.4.1 Vegetation

Three vegetation species at risk have been reported from the study area; these are discussed below.

American chestnut, listed as Endangered on both Schedule 3 of the ESA and Schedule 1 of SARA, was reported in 1986 from the extreme southwest portion of the study area (see Figure 3.2; NHIC, 2008a). No American chestnut were observed within the study area during baseline investigations. The American chestnut prefers arid forests (Government of Canada, 2008b), a habitat type which is generally absent within the study area. Given that the footprint of the proposed development will be restricted to agricultural lands, it is not expected that there will be any impact on American chestnut and this species is not considered further in this report.

Willowleaf aster, listed as Threatened on both Schedule 4 of the ESA and Schedule 1 of SARA, was reported in 1991 from the extreme northeast corner of the study area (see Figure 3.2; NHIC, 2008a). Restricted to southwestern Ontario, the willowleaf aster is most commonly found in oak savannahs, but is also present in disturbed areas such as roadsides, along railways, and in abandoned fields (Government of Canada, 2008c). Though not recorded during baseline investigations, it is expected that the willowleaf aster remains present in the study area at the location identified in 1991. Potential impacts to willowleaf aster are addressed in Section 4.3.8.

Dense blazing star, listed as Threatened on both Schedule 4 of the ESA and Schedule 1 of SARA, was reported in 1991 from the extreme northeast corner of the study area (see Figure 3.2; NHIC, 2008a). Habitat associations of the dense blazing star are moist prairies, savannahs, dune swales and abandoned fields in coarse sand or sandy loam soils (Government of Canada, 2008d). Though not recorded during baseline investigations, it is expected that the dense blazing star remains present in the study area at the location identified in 1991. Potential impacts to dense blazing star are addressed in Section 4.3.8.

3.3.4.2 Avifauna

Of those species observed during baseline investigations, or reported from >5% of squares within OBBA Region 2 (Chatham-Kent), 15 are considered to be Species at Risk (see Table 3.4). Of these 15 species, the following seven were eliminated from further consideration for the following reasons:

- Least Bittern – The Least Bittern, a species of heron, is listed as Threatened on Schedule 1 of SARA and Schedule 4 of the ESA. They are commonly found in cattail marshes (Woodliffe, 2007a), a habitat type which is not found within the study area. Though a Least Bittern was recorded as probable for breeding within OBBA square 17MH30 which overlaps the study area (see Table 3.4), there is no indication as to where or when this occurrence was noted. Therefore, the Least Bittern is not expected to occur within the study area.

- Northern Bobwhite (*Colinus virginianus*) – The Northern Bobwhite, a species of quail, is listed as Endangered on Schedule 1 of SARA and Schedule 3 of the ESA. Northern Bobwhite is a species of natural grasslands (Risley, 2007), of which there is a general absence within the study area. In Ontario, naturally occurring populations are restricted to Walpole Island, with most occurrences beyond Walpole Island considered to be non-native birds (Risley, 2007). No Northern Bobwhite were recorded within either OBBA square which overlaps the study area (see Table 3.4). As a result of the absence of habitat and observations, and the fact that most observations beyond Walpole Islands are considered non-natives, the Northern Bobwhite is not expected to occur within the study area.

- King Rail (*Rallus elegans*) – The King Rail, a gruiforme, is listed as Endangered on Schedule 1 of both SARA and the ESA. King Rails are commonly found within large marshes (Woodliffe, 2007b), which are absent from the study area. During OBBA surveys within the region, King Rails were restricted to the large marshes of the Greater Rondeau IBA (Woodliffe, 2007b). As a result of the absence of habitat and observations from the study area, King Rails are not expected within the study area.

- Black Tern (*Chlidonias niger*) – Black Terns are listed as Special Concern on Schedule 5 of the ESA, and as Not at Risk by COSEWIC. Black Terns nest colonially on shallow freshwater marshes with emergent vegetation, where they also forage for fish; marshes greater than 20 ha in size are preferred (Dunn and Agro, 1995). As for King Rails, habitat of this type is not common within the Project location and observations during OBBA surveys are restricted to the large marshes of the Greater Rondeau IBA (Weseloh, 2007). As a result, Black Terns are not expected within the study area.

- Cerulean Warbler (*Dendroica cerulea)* – Cerulean Warblers are listed as Special Concern on Schedule 1 of SARA and Schedule 5 of the ESA. Cerulean Warblers breed in the canopy of large mature deciduous forest with interior forest habitat (Francis, 2007). As with other birds, there is an absence of this habitat type within the study area, and observations from the area were restricted to the woods of Rondeau Provincial Park (Francis, 2007). Therefore, this species is not expected to occur within the study area.

- Prothonotary Warbler (*Protonotaria citra*) – Prothonotary Warblers are listed as Endangered on both Schedule 1 of SARA and the ESA. They are commonly found in mature, deciduous swamp forests and forested floodplains (McCracken, 2007). Habitat of this type is not found within the study area. Surveys of the woodlots of the study area, did not reveal the presence of any Prothonotary Warblers. Presence during OBBA surveys within the region was restricted to the Greater Rondeau IBA. As a result of the absence of observations and habitat within the study area, this species is not expected to occur.

- Whip-poor-will (*Caprimulgus vociferus*) – Whip-poor-will are listed as Threatened on Schedule 4 of the ESA and by COSEWIC, though not yet included on SARA. Preferred habitat for Whip-poor-will is found in rock or sand barrens with scattered trees, savannahs, old burns in a state of early forest succession, and open conifer plantation (Mills, 2007). Such habitat is not found within the study area and no Whip-poor-wills were recorded during site investigations; as such Whip-poor-will are not expected to occur.

The eight species that remained were either observed during baseline investigations, or sufficient suitable habitat is present within the study area that the species may potentially occur, though it went undetected during baseline investigations:

- Bald Eagle – Bald Eagles within this portion of the province are listed as Special Concern on Schedule 5 of the ESA, though Not at Risk by COSEWIC. A Bald Eagle nest with young was recorded within OBBA square 17MH30, which overlaps the study area (see Table 3.4). However, this nest is found approximately 2 km south of the study area, in a larger woodlot (Dillon Consulting Ltd., 2008). Movement from this nest location would be expected toward the shore, however occasional movements within the study area cannot be ruled out. As a result, though no observations of Bald Eagles were made during baseline investigations, potential impacts on this breeding pair are considered.
- Golden Eagle – Golden Eagles are listed as Endangered on Schedule 1 of the ESA, but Not at Risk by COSEWIC. A single Golden Eagle was observed within one of the woodlots during over-wintering surveys in 2008. Golden Eagles breed within the extreme north of the province of Ontario and only occurs in the area during migration. With only one individual observed, golden eagle movement through the study area is considered to be uncommon.
- Common Nighthawk – The Common Nighthawk is listed as Threatened on Schedule 1 of SARA, and Special Concern on Schedule 5 of the ESA. Common nighthawk are commonly observed foraging on the wing for insects over clearings, fields, ponds, and other open areas. Preferred nesting sites are bare ground in open areas or gravel rooftops in urban environments (Poulin et al, 1996). Suitable habitat for Common Nighthawk is found within the study area, though none were observed during baseline investigations and they are not expected to be currently breeding within the study area. Though not recorded during the breeding period, two Common Nighthawk were observed flying south across the study area in August, which is considered to be a migratory movement of this species. However, no other observations of Common Nighthawk were made during this time and their passage across the site is considered to be uncommon.
- Chimney Swift – The Chimney Swift is listed as Threatened on Schedule 1 of SARA and Schedule 4 of the ESA. Chimney Swift are commonly observed over cities foraging on the wing for insects in the early morning and at dusk. Though this species nests in hollow trees or other tree cavities in undisturbed areas, in urban environments they are commonly found, as would be expected, nesting in chimneys (Cadman, 2007). Suitable habitat is available within the study area, and Chimney Swifts were observed foraging over the town of Highgate during the summer, though none were observed beyond the town limits.
- Red-headed Woodpecker – The Red-headed Woodpecker is listed as Special Concern on Schedule 5 of the ESA and on Schedule 3 of SARA. Though not observed during baseline investigations, Red-headed woodpeckers were considered to be probable breeders within OBBA square 17MH30, which overlaps the study area (see Table 3.4). Red-headed Woodpecker commonly breed in open woodlands and woodland edges, especially riparian forest. Red-headed Woodpeckers require large, dead weathered trees or live trees with large dead branches for provision of nest sites (Woodliffe, 2007c). Habitat of this type is common in the study area, and it is likely that though none were observed during baseline investigations, they do occur

within the study area. However, suitable habitat is not found within 120 m of the Project location and therefore

- Canada Warbler – Canada Warbler are listed as Threatened on Schedule 1 of SARA, and Special Concern on Schedule 5 of the ESA. Canada Warblers are commonly found in moist forests with a well-developed understorey (McLaren, 2007). Habitat of this type is limited, though available within the study area. Though none were observed during baseline investigations, including broadcast surveys within woodlots to elicit response in this species, OBBA surveys within square 17MH30 recorded this species as a possible breeder. Suitable habitat is not found on or within 120 m of the Project location.
- Yellow-breasted Chat – Yellow-breasted Chats are listed as Special Concern on Schedule 1 of SARA and Schedule 5 of the ESA. They are commonly found in scrubby, early successional habitats common to, among others, regenerating old fields and forest edges (Eagles, 2007), habitat which is common within the study area. Though none were observed during baseline investigations, Yellow-breasted Chats were described as probably/possibly breeding in the vicinity of the Greater Rondeau and Clear Creek IBAs (Eagles, 2007). Given the availability of suitable habitat within the study area, and the proximity of known populations, this species is considered as a possible, though undetected, breeder within the study area. Suitable habitat is not found on or within 120 m of the Project location.
- Bobolink (*Dolichonyx oryzivorus*) – Bobolink are listed as Threatened on Schedule 4 of the ESA. Bobolink is a species found in grasslands, including hayfields (Gahbauer, 2007), which are prevalent throughout the study area. Bobolink were recorded during baseline investigations within the study area. Bobolink are likely breeding within the hayfields and riparian corridors of the study area.

3.3.4.3 Mammals

The American Badger, listed as Endangered on Schedule 3 of the ESA and Schedule 1 of SARA, is the only mammal considered to be a Species at Risk with the possibility of occurrence within the study area. Habitat requirements for badger are not well understood. The key feature for suitable habitat is soils suitable for burrowing and capable of supporting populations of burrowing mammals, such as Eastern Cottontail and Woodchuck (*Marmota monax*), which comprise their primary prey. In Southern Ontario, open green spaces, from natural grasslands to agricultural fields and golf courses, are used. Habitat for badgers within the province is fragmented by existing road networks. (Government of Canada, 2008e). There is a historical record (1953) of American Badger from the extreme southwest of the study area (see Figure 3.2). However there are no known sightings since (NHIC, 2008a). Given that badger are primarily a nocturnal species (Government of Canada, 2008e), it remains possible that they are present within the study area, though undetected.

3.3.4.4 Reptiles and Amphibians

Based on known ranges of reptiles and amphibians, there are 13 species of reptiles and amphibians that may potentially occur within the study area. Of these species, 10 were eliminated from consideration in this report based on an absence of suitable habitat (as identified in McKenney et al., 2007) and no records within the study area

- Fowler's Toad, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, are adapted to sandy areas near marshes and ponds present along the north shoreline of Lake Erie.
- Spiny Softshell, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, prefer wide, slow-moving muddy rivers and soft-bottomed bays and ponds.
- Blanding's Turtle, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, is commonly associated with shallows, ponds and marshes with soft bottoms and abundant aquatic vegetation.
- Wood Turtle, listed as Endangered on Schedule 3 of the ESA, and Special Concern on Schedule 3 of SARA, prefers open woodlands and meadows around gravel-bottomed streams.
- Northern Map Turtle, listed as Special Concern on Schedule 5 of the ESA and Schedule 1 of SARA, prefers slow moving rivers, ponds, and marshes.
- Snapping Turtle, listed as Special Concern on Schedule 5 of the ESA and by COSEWIC, though not yet included on SARA, are commonly found in slow-moving waterbodies with a soft mud bottom and dense aquatic vegetation.
- Five-lined Skink, listed as Endangered by COSEWIC in 2007 (and yet to be added to SARA), this species is found in Carolinean forests on the shores of Lake Erie, Lake St. Clair, and Lake Huron (COSEWIC, 2007a).
- Eastern Hog-nosed Snake, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, prefer forested areas and wetlands, with agricultural and urban areas least suitable for use (COSEWIC, 2007b).
- Queen Snake, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, are an aquatic species found in permanent areas of water, with rocky bottoms, and an abundance of cover and crayfish. Modification of natural water features for agricultural and drainage requirements has eliminated much of the available habitat in southern Ontario for this species (COSEWIC, 2000).
- Eastern Ribbon Snake, listed as Special Concern on Schedule 5 of the ESA and Schedule 1 of SARA, prefers low vegetation on the edge of quiet, shallow waters such as ponds, streams, marshes, swamps or bogs (COSEWIC, 2002a).

The remaining three species are considered in Section 4.3.9 of this report with respect to potential impacts from the proposed development

- Spotted Turtle, listed as Endangered on Schedule 3 of the ESA and Schedule 1 of SARA, may be found in wet woodlands with vernal pools (McKenney et al, 2007). No records of the Spotted Turtle exist for the study area (NHIC, 2008a).
- Eastern Fox Snake, listed as Threatened on Schedule 4 of the ESA and Schedule 1 of SARA, and as Endangered by COSEWIC (as of April 2008), are commonly observed in early successional vegetation communities (e.g., old fields) during the summer, with hedgerows bordering farm fields and riparian zones along drainage canals regularly used in areas of intensive farming

where habitat availability is limited (COSEWIC, 2008). No records of the Eastern Fox Snake exist for the study area (NHIC, 2008a).

- Eastern Milksnake, listed as Special Concern on Schedule 5 of the ESA and Schedule 1 of SARA, is a habitat generalist being found in an array of habitats from fields to forests (COSEWIC, 2002b). An eastern Milksnake was reported in 1982 just north of the study area (see Figure 3.2), and it is assumed that this species may remain present in the study area. Suitable habitat is found on and within 120 m of the Project location.

3.3.5 Parks and Significant Natural Areas

All parks and significant natural areas within the local area are shown in Figures 3.1 and 3.2.

Rondeau Provincial Park

Rondeau Provincial Park (Rondeau) is located on a sandspit which juts into Lake Erie approximately 17 km south-southwest of the study area. Rondeau, which encompasses the entire 3254-ha sandspit, is classified as a Natural Environment class park. Natural Environment parks are established to protect landscapes and special features of their local natural region, while providing ample opportunities for activities such as swimming and camping. There is currently no Park Management Plan for Rondeau (Ontario Parks, 2008).

Several habitat types make up the park, including hardy grasses on sand dunes, marshlands where herons, bitterns and rails nest, an oak savannah, and one of Canada's largest sections of Carolinian forest. Within the forest, beech, sassafras, sugar maple, shagbark hickory and tulip trees thrive. Rare species, including the provincially and federally endangered Prothonotary Warbler and the provincially and federally threatened Spiny Softshell Turtle can also be found in Rondeau (Ontario Parks, 2008).

The nature of the habitat found in Rondeau, including the sandspit and protected bay that it forms, attracts significant numbers of migrating shorebirds and waterfowl every spring and fall, including large numbers of Tundra Swans (Bird Studies Canada et al., 2008a).

The primary objective for all provincial parks including Rondeau, as identified in the Provincial Parks and Conservation Reserves Act (2006), is to maintain the ecological integrity[1] of the park.

Important Bird Areas (IBA)

- Clear Creek (ON033) – Located >120 m south of the study area along Clear Creek, the 400-ha Clear Creek IBA encompasses the closed-canopy deciduous forest found in this area. This is one of the most significant sites for the nationally and provincially endangered Acadian

[1] From the Provincial Parks and Conservation Reserves Act (2006):
Ecological Integrity
Ecological integrity refers to a condition in which biotic and abiotic components of ecosystems and the composition and abundance of native species and biological communities are characteristic of their natural regions and rates of change and ecosystem processes are unimpeded. 2006, c. 12, s. 5(2).
Same
For the purpose of subsection (2), ecological integrity includes, but is not limited to
(a) healthy and viable populations of native species, including species at risk, and maintenance of the habitat on which the species depend; and
(b) levels of air and water quality consistent with protection of biodiversity and recreational enjoyment. 2006. c.12, s. 5(3)

Flycatcher, with a significant proportion of their population found within this forest (Bird Studies Canada et al., 2008b).

- Southwest Elgin Forest Complex (ON048) – Located >120 m southeast of the study area, this IBA encompasses a 20 km stretch of discontinuous deciduous woodlots that are within 5 km of the Lake Erie shoreline. Hooded Warbler (*Wilsonia citrina*), a nationally and provincially threatened species, and Acadian Flycatcher are present within some of the woodlots (Bird Studies Canada et al., 2008c).
- Greater Rondeau Area (ON007) – Located >120 m southwest of the study area, the IBA is centered on Rondeau Provincial Park, but also encompasses Rondeau Bay and associated marshes, and several other habitats in the area. The wetlands of the Greater Rondeau Area support significant populations of migrating waterfowl and shorebirds, including Tundra Swan, Common Goldeneye (*Bucephala clangula*), Ruddy Turnstone (*Arenaria interpres*), Forsters Tern (*Sterna forsteri*), Black-bellied Plovers, American Golden-Plover, and Whimbrel (*Numenius phaeopus*). In addition, several nationally and provincially endangered species nest within Rondeau Provincial Park, including Prothonotary Warbler, Acadian Flycatcher, and King Rail, as well as the nationally and provincially threatened Least Bittern (Bird Studies Canada et al., 2008a).

Earth and Life Science Areas of Natural and Scientific Interest, Provincially Significant Wetlands (NHIC, 2008a)

No Earth or Life Science Areas of Natural and Scientific Interest are found within 120 m of the Project location; however, others found nearby that include

- Taylor Pond (Life Science Site) and Taylor Pond Wetland Complex (Provincially Significant Wetland); Area IDs: 5129/8277 and 10631, respectively. Located more than 120 m east of the Project location.
- South Rodney Woods (Life Science Site) and South Rodney Woodlot – Wetland (Provincially Significant Wetland); Area IDs 5089 and 8622, respectively. Located more than 120 m east of the Project location.
- Wayne Smith's Woodlot – Wetland (Provincially Significant Wetland); Area ID 8397. Located more than 120 m south of the Project location along Clear Creek.
- Clear Creek (Regionally Significant Life Science Area of Natural and Scientific Interest (ANSI)); Area ID 4577. Located more than 120 m south of the Project location along Clear Creek.
- Duart Rolling Sandland (Life Science Site); Area ID 7014. Located more than 120 m south of the Project location.
- Highgate Rail Road Prairie West (Life Science Site); Area ID 5039. Located more than 120 m west of the Project location.

3.4 Atmospheric Environment

3.4.1 Climate

The geographic location is highly influenced by its proximity to Lake Erie, with a regulatory effect occurring, making summer seasons cooler, and winters milder than areas farther inland.

Table 3.29 describes monthly climatic statistics for Ridgetown, Ontario (Environment Canada's nearest long-term monitoring station with data for at least 15 years from 1971 to 2000). Ridgetown is located on the north shore of Lake Erie, approximately 35 km west of the study area. The average temperature for the area fluctuates by ~28°C throughout the year with winter (December to March) temperatures averaging ~-3°C and summer (June to September) temperatures averaging ~20°C. (Environment Canada, 2008a).

Table 3.29 Monthly Climatic Statistics for Ridgetown, Ontario (1971 to 2000)[1]

Month	Daily Average Temperature (ºC)	Daily Maximum Temperature (ºC)	Daily Minimum Temperature (ºC)	Monthly Average Rainfall (mm)	Monthly Average Snowfall (cm)
January	-6.0	-2.5	-9.5	25.6	28.6
February	-4.6	-1.0	-8.2	36.1	25.4
March	0.7	4.5	-3.1	66.6	15.2
April	7.1	11.9	2.2	73.0	4.5
May	13.6	18.9	8.3	76.8	Nil
June	18.8	23.9	13.5	82.1	Nil
July	21.5	26.8	16.2	92.8	Nil
August	20.6	25.5	15.6	104.9	Nil
September	16.8	21.6	12.0	92.9	Nil
October	10.6	14.8	6.3	55.4	0.1
November	4.5	8.0	1.0	84.2	9.0
December	-1.9	1.4	-5.2	61.1	34.5

[1]Source: Environment Canada, 2008a

Of the climate characteristics that are recorded, that which perhaps has the greatest influence on potential impacts from wind power facilities is the number of days with poor visibility, as this can increase the risk to birds. Unfortunately, there is no meteorological station within the area that records visibility levels, with the nearest being the station at the London (ON) International Airport, located approximately 70 km east-northeast of the study area. At this station, an average of 200 hours (~2.2% of the year) of poor visibility (<1 km) were recorded Table 3.30). The poorest visibility was recorded during the winter months (December through March), when bird activity over the site is lower. During the periods of peak bird activity, visibility is expected to be good (>1 km) for over 98% of the time. Though the London station is located away from the Project location, results are expected to be fairly representative of the site itself.

Table 3.30 Monthly Visibility Statistics for London, Ontario (1971 to 2000)[1]

Visibility	Month												Year
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
<1 km	27.8	27.0	23.3	7.3	6.4	7.6	7.9	14.1	15.1	18.1	15.2	30.4	200.2
1 to 9 km	253.8	203.8	183.5	116.1	136.3	146.4	161.9	195.9	167.9	143.5	187.5	232.8	2129.4
> 9 km	462.5	447.4	537.2	596.6	601.3	566.0	574.2	534.0	537.0	582.5	517.4	480.8	6436.9

[1]Source: Environment Canada, 2008b

3.4.2 Air Quality

The Air Quality Index (AQI) is a measure of air quality based on hourly pollutant levels of sulphur dioxide, ozone, nitrogen dioxide, total reduced sulphur compounds, carbon monoxide and fine particulate matter. According to the MOE, AQI values less than 32 are relatively good, values between 33 and 49 may have some adverse effects on very sensitive people, values between 50 and 99 may have some short-term adverse effects on the human or animal populations, or may cause significant damage to vegetation and property, and values greater than 100 may cause adverse effects on a large proportion of those exposed.

The nearest air quality monitoring station to the Project location is located in Chatham, Ontario, ~35 km west of the Project location. Based on daily measurements taken from 2006 through 2008, the average daily AQI is 25.30 (good) with a standard deviation of 9.82, and extremes of 5 (very good) on January 11 and February 3, 2006, and 57 (poor) on May 31, 2007 (MOE, 2009).

3.5 Social Environment

The Project location lies within the Municipality of Chatham-Kent, more specifically within East Kent Ward. In close proximity to the Project are the communities of Duart and Highgate. Located approximately 10 km southwest of the Project is the larger community of Ridgetown, while approximately 7 km northeast, and within the Municipality of West Elgin is the community of Rodney. The Project is located in close proximity to the Municipality of West Elgin, approximately 500 m to the northeast.

Three landowners within the Project location are participants in the Project, meaning that they have leased lands to Saturn Power for the purpose of developing the Project. This is discussed further in Section 3.5.4.2. For the purposes of characterizing the social environment, within which the Project is proposed, the study area and Project location have been defined below.

Study Area – In consideration of the social environmental components potentially affected by the Project, the social study area is tailored to match the geographic extent of those potential impacts. The social impacts of the Project will likely extend into the surrounding areas beyond the study area defined for the Natural Environment (Section 3.1) to include the local population centres of Highgate, Ridgetown, Rodney and the greater Municipalities of Chatham-Kent and West Elgin. These areas are illustrated in Figure 1.1.

Project location – The defined Project location for the purposes of this environmental assessment includes essentially the footprint of construction, therefore the turbine locations and access roads. These areas are illustrated in Figure 4.1.

Information used to characterize the social environment was obtained from various sources including government websites (i.e., Municipality of Chatham-Kent, Statistics Canada), document and literature

review, management plans, and field observation. Feedback provided by stakeholders during the planned Public Information Centre (PIC) has also provided additional information regarding local area use.

3.5.1 Community Profile

3.5.1.1 Population Characteristics

Based on Statistics Canada's 2006 census data, the Municipality of Chatham-Kent has an area of 2494 km^2 and a population of 108,177 people in 2006. This represents a 0.8% increase from 5 years earlier when the population was recorded to be 107,341 in 2001. The Project is located within Orford Township, where the population was recorded to be 1214 in 2006. The Chatham-Kent Community Profile also provides population information for nearby communities including Chatham – 45,282, Ridgetown – 3254 and Highgate – 413 (Municipality of Chatham-Kent, 2008).

The population of West Elgin was 5349 in 2006, representing a decrease of 2.1% from 2001.

Table 3.31 provides population information for the Municipalities of Chatham-Kent and West Elgin along with the Province of Ontario, while Table 3.32 provides statistical information on the highest levels of schooling according to the 2006 census.

Table 3.31 Population Characteristics for Chatham-Kent, West Elgin and the Province of Ontario, 2006

Census Data	Chatham-Kent	West Elgin	Ontario
Population Counts			
Population in 2006	**108,177**	**5,349**	**12,160,282**
Population in 2001	**107,341**	**5,464**	**11,410,046**
Population Change 2001 to 2006 (%)	**0.8**	**-2.1**	**6.6**
Age Characteristics			
Median Age of the Population	**41.2**	**42.9**	**39.0**
Percentage of the population aged 15 years and older	**81.8**	**83.1**	**81.8**

Source: Statistics Canada, 2007

Table 3.32 Selected Post-Secondary Educational Attainment Data for the Municipalities of Chatham-Kent and West Elgin as well as the Province of Ontario

Educational Attainment	Chatham-Kent Municipality	West Elgin Municipality	Ontario
Total population 15 years and over	87,025	4,405	9,819,420
No certificate, diploma or degree	26,690	1,635	2,183,625
High school certificate or equivalent	25,455	1,245	2,628,575
Apprenticeship or trades certificate or diploma	7,545	490	785,115
College, CEGEP or other non-university certificate or diploma	17,720	735	1,804,775
University certificate or diploma below the bachelor level	1,910	65	405,270
University certificate, diploma or degree	7,705	225	2,012,060
Total population aged 15 to 24	14,710	710	1,624,835

Educational Attainment	Chatham-Kent Municipality	West Elgin Municipality	Ontario
No certificate, diploma or degree	6,855	400	648,300
High school certificate or equivalent	5,465	235	627,010
Apprenticeship or trades certificate or diploma	320	0	37,475
College, CEGEP or other non-university certificate or diploma	1,475	40	160,140
University certificate or diploma below the bachelor level	75	0	33,875
University certificate, diploma or degree	520	25	118,030
Total population aged 25 to 34	11,290	480	1,529,590
No certificate, diploma or degree	1,720	75	132,715
High school certificate or equivalent	3,470	190	364,260
Apprenticeship or trades certificate or diploma	765	60	91,525
College, CEGEP or other non-university certificate or diploma	3,485	115	372,355
University certificate or diploma below the bachelor level	225	0	68,800
University certificate, diploma or degree	1,625	40	499,935
Total population aged 35 to 64	44,850	2,385	5,108,740
No certificate, diploma or degree	10,000	730	766,810
High school certificate or equivalent	13,430	695	1,296,405
Apprenticeship or trades certificate or diploma	4,715	305	489,605
College, CEGEP or other non-university certificate or diploma	10,960	490	1,089,270
University certificate or diploma below the bachelor level	1,075	40	241,150
University certificate, diploma or degree	4,665	130	1,225,490

Source: Statistics Canada, 2007

Median income in 2005 as provided by Statistics Canada for all families in Chatham-Kent was $63,213 (31,260 families). Median income for a single person household was $25,125 (Statistics Canada, 2007). In West Elgin, the average income for males working the full year is $39,297, based on the 2006 Census.

3.5.1.2 Local Residents

Rural residences in the vicinity of the Project include both those participating in the Project (i.e., leasing lands), and non-participants. However, there are no buildings or residences located on lands under lease option for the Project. Local residents are discussed within the Acoustic Assessment Report (Appendix A) completed for the Project. As presented within the report (Table 6: Wind Turbine Noise Impact Summary) there are 49 residences within 1679 m of the Project. Residents in the vicinity of the Project are shown as points of reception in Figure 2 of the Acoustic Assessment Report.

3.5.1.3 Property Values

The Municipality of Chatham–Kent Community Profile indicates that the average price of a detached bungalow is $142,000 and the average price of a standard two storey is $182,000, for spring 2002.

Rental accommodations averaged $550 to $600 a month for a two-bedroom apartment (Statistics Canada, 2008).

3.5.1.4 Employment and Industry

Labour force indicators for Chatham-Kent described the participation factor as 65.8% in 2006; the unemployment rate was recorded to be 7.2%. Labour force indicators for West Elgin show the participation factor as 62.5% in 2006; the unemployment rate was recorded to be 4.4%. By comparison, the provincial participation rate was 67.1%, while the employment rate was 62.8% and the unemployment rate was 6.4%. According to Statistics Canada (2008) Chatham-Kent and West Elgin has an experienced labour force totalling 56,635 and 2700 people, respectively. Table 3.33 provides the total experienced labour force by industry percentages in comparison with the province of Ontario.

Table 3.33 Total Experienced Labour Force by Industry for the Municipalities of Chatham-Kent and West Elgin, 2006

Industrial Classification	Chatham-Kent	West Elgin	Ontario
Total experienced labour force 15 years and over	56,540	2,700	6,473,730
Agriculture and other resource-based industries	5,065	340	190,000
Construction	2,760	185	384,775
Manufacturing	11,765	645	899,670
Wholesale trade	2,245	80	307,465
Retail trade	6,610	245	720,235
Finance and real estate	2,010	100	442,610
Health care and social services	5,310	160	611,740
Educational services	2,870	95	433,485
Business services	8,280	400	1,274,345
Other services	9,615	440	1,209,390

Source: Statistics Canada, 2007

Major private sector employers within Chatham-Kent include the following:

- International Truck & Engine Corp., 1150 employees
- Union Gas Limited, 706 employees
- YA Canada, 480 employees
- Mahle, 480 employees
- Autoliv Canada, 471 employees
- Arvin Meritor, Inc., 350 employees
- NuComm International, 350 employees
- Omstead Foods limited, 350 employees
- Siemens VDO Automotive, Chatham, 336 employees

- Minacs Worldwide Inc., 300 employees.

The majority of business in the vicinity of the Project is family owned agribusiness; however, there are other businesses in the area including CA Rankin Transport located in Highgate. Delrue Greenhouses and Perennial Haven Nursery and Gardens are located in the nearby community of Muirkirk (Chatham-Kent Economic Development Services, 2007).

Local businesses in West Elgin in close proximity to the Project are located in the community of Rodney. Businesses include car dealerships, auto repair facilities, and restaurants along with a dentist office, florist, insurance agent and hair salon.

3.5.1.5 Manufacturing

Construction and manufacturing industries accounted for a major portion of labour force employment in 2006 (see Table 3.33 above). At the time, major manufacturers and supporting industries included OEM International Truck and Engine, other automotive manufacturers and supporting manufacturers. Also noteworthy are the municipality's machine, mould, tool and die industries (Municipality of Chatham-Kent, 2008). OEM International Truck and Engine has since closed.

3.5.1.6 Agriculture

Statistical information on Ontario farming is provided by the Ontario Ministry of Agriculture, Food and Rural Affairs (2006) by county/municipality. In Chatham-Kent over 70% of farms in the municipality are dedicated to oilseed and grain farming, followed by vegetable and melon farming (7.6%), "other" crop farming (5.2%), and hog and pig farming (4.5%). Soybeans (90,395 ha), corn for grain (49,661 ha) and winter wheat (40,611 ha) represent the most farmed field crops (in area) accounting for 96% of all field crops in the municipality (OMAFRA, 2009). Table 3.34 provides information regarding gross revenue of farm business in 2007 as provided by OMAFRA.

Chatham-Kent is the largest producer of seed corn, tomatoes and sugar beets in Canada, and opportunities for growth in the food industry continue to support vegetable processing, food use soybean production and processing and value-added farm marketing such as "Pick your Own" experiences (Municipality of Chatham-Kent, 2008).

Table 3.34 Farm Cash Receipts for Main Commodities, Chatham-Kent, 2007

Commodity	$ Millions
Soybeans	**108.7**
Corn	**59.3**
Field Vegetables	**56.6**
Hogs	**41.0**
Greenhouse Vegetables	**23.6**
Wheat	**19.7**
Eggs	**14.6**
Cattle and Calves	**10.6**
Total	**406.3**

Source: OMAFRA, 2009.

Biofibre as a replacement for wood fibre is a growing industry. Generated from straw, grains, soy stalks, corn stalks, oat hulls and hemp, biofibre is an emerging opportunity for the municipality in agriculture. As a result of Chatham-Kent's successful soybean production biodiesel is another important opportunity for growth within the municipality. Greenfield Ethanol expanded their Chatham-Kent facility to accommodate increased industrial ethanol production and as of 2008 was Canada's largest supplier of ethanol, industrial fuel and beverage grade alcohols.

Currently, the Southwestern Ontario Bioproducts Innovation Network (SOBIN) is seeking to develop, along with research and academic institutions and private industry, a Centre for Agricultural Renewable Energy and Sustainability (CARES) to "harness and integrate energy conservation and production technology and to develop agricultural systems that add value to the production of this energy at the farm level" (Municipality of Chatham-Kent, 2008).

3.5.1.6.1 Land Capability Class Descriptions – Canada Land Inventory, Agriculture

The Canada Land Inventory (CLI) is a land inventory of rural Canada which has evolved from a federal-provincial project conceptualized in the 1960s by the Department of Forestry and Rural Development into its present day form as a rating system of agricultural land capability. Managed by the Department of Agriculture since 1995, the CLI now consists of a soil survey with rankings from 1 to 7. Class 1 soil is considered to be prime agricultural land, while Class 7 would have no capability for agricultural activities (The Canadian Encyclopedia, 2009).

Within the study area for the Project, land rankings according the CLI are presented in Table 3.35 below. These lands are shown in Figure 3.14.

Table 3.35 Canada Land Inventory Rankings within the Project Study Area

Canada Land Inventory Rating	Definition	Percentage of Project Location (%)
Class 1	**Soils in this class have no significant limitations for crops**	**18**
Class 2	**Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices**	**70**
Class 4	**Soils in this class have severe limitations that restrict the range of crops or require special conservation practices**	**12**

3.5.2 Municipal Profile

The study area lies within the Municipality of Chatham-Kent, more specifically within East Kent Ward. Along MacPherson Road, the Project is in close proximity to the border of the Municipality of West Elgin, one of seven municipalities within Elgin County.

3.5.2.1 Municipality of Chatham-Kent

The Ward of East Kent, restructured in 1997, is an amalgamation of various former municipalities comprised of the Town of Bothwell, the Town of Ridgetown, the Township of Howard, the Township of Orford, the Township of Zone, part of the Township of Camden, the Village of Thamesville, and the Village of Highgate.

There are six wards within the Municipality of Chatham-Kent: West Kent, South Kent, Chatham, Wallaceburg, North Kent and East Kent. The municipality of Chatham-Kent is responsible for public health, municipal roads and water and sewer infrastructure, hydro services, provision of police and ambulance service, municipality wide emergency preparedness, education services and regional planning.

3.5.2.2 Municipality of West Elgin

Lying immediately to the east of the study area is the municipality of West Elgin, one of seven municipalities that make up Elgin County. In 1998, Elgin County restructured to become: Municipality of Bayham, Municipality of Central Elgin, the Municipality of Dutton/Dunwich, the Municipality of West Elgin, the Town of Aylmer, the Township of Malahide and the Township of Southwold.

The County of Elgin is responsible for county wide emergency preparedness, ambulance services, municipal roads, library services and county wide planning. The Municipality of West Elgin provides services for infrastructure, water, recreation and planning/development.

3.5.3 Land Use Policies

An Official Plan or zoning by-law does not apply to a renewable energy generation project under the Green Energy Act and O.Reg. 359/09, which was officially enacted on September 24, 2009. According to the REA, Saturn Power will however, be required to consult with municipalities on the following items:

- proposed Project location and property boundaries
- proposed road access location
- location and type of municipal service connections that may be required
- traffic management plans during construction and operation
- construction plans related to rehabilitation of temporary disturbance areas and any municipal infrastructure that may be damaged during construction
- emergency management procedures/safety protocols as specified in the Response Plan.

3.5.4 Local Land Use and Tenure

3.5.4.1 Local Land Use

Within the municipality of Chatham-Kent the total area comprised by farms according to the 2006 census was 224,102 ha. This represents approximately 90% of the area of the municipality (249,400 ha). The majority of farms were under 53 ha (46%), while farms between 53 and 161 ha represented 34% and farms 162 ha and over represented 20%. Total greenhouse area under glass or plastic within the municipality represented 337,970 m^2 (OMAFRA, 2009). Table 3.36 provides information regarding more specific farm land use.

The Project location is predominantly used for agricultural purposes. Other land uses in the vicinity include an abandoned CNR line. A number of petroleum and water tanks are located along the abandoned railway corridor. Commercial and residential land uses are found in Highgate, Duart and Rodney. There are a number of existing or abandoned pit or quarry sites located south, north and northeast of the Project location.

Table 3.36 Farm Land Use: Chatham-Kent, 2006

Land Use (2006 Census)	Municipality of Chatham-Kent (ha)	Percentage of Municipality (%)	Percent of Province (%)
Land in Crops	**209,465**	**83.99**	**5.72**
Summer fallow land	**55**	**0.02**	**0.46**
Tame or seeded pasture	**1,824**	**0.73**	**0.60**
Natural land for pasture	**1,613**	**0.65**	**0.36**
Christmas trees, woodland and wetland	**6,876**	**2.76**	**0.92**
All other land	**4,270**	**1.71**	**2.04**
Total Area of Farms (ha)	**224,103**	**89.86**	**4.16**

Source: OMAFRA, 2009.

3.5.4.2 Land Tenure

All lands within the study area are privately held. Lease option agreements have been signed for all lands within the Project location.

3.5.5 Tourism and Recreation

There are no known tourist attractions located within the Project location, nor are there any known recreational sites within the Project location.

3.5.5.1 Local Parks and Nature Reserves

Rondeau Provincial Park is located approximately 20 km southwest of the study area, on the shores of Lake Erie. The park provides opportunities for camping, boating, fishing, birding and wildlife viewing.

3.5.6 Cultural Heritage Resources

3.5.6.1 Stage 1 Archaeological Assessment of the Proposed Gesner (Highgate) Wind Power Development, Orford Geographic Township, Municipality of Chatham-Kent, Ontario

Hatch contracted D.R. Poulton and Associates in October 2008 on behalf of Saturn Power to undertake an archaeological assessment of lands potentially impacted during the construction of the proposed Gesner (Highgate) Wind Power Development. The Stage 1 Archaeological Assessment was completed in accordance with the technical guidelines for archaeological assessment formulated by the Ministry of Culture (MCTR, 1993) the purpose of which was to "obtain information on past archaeological investigations and known and potential sites in the study area. More specifically, the assessment was intended to obtain information on potential archaeological constraints to the proposed construction of the wind power development, and to evaluate the need for more detailed Stage 2 archaeological survey" (D.R. Poulton and Associates Inc., 2009). A copy of the Stage 1 Archaeological Assessment is included as Appendix E.

It was found that no archaeological sites have been recorded in the vicinity of the study area. The total lack of past archaeological investigation has led to a total absence of documented archaeological resources. The report concluded that "the study area has at least a moderate potential for as-yet undiscovered archaeological sites". Based on this conclusion, the archaeologist has recommended that a Stage 2 assessment be conducted. The recommendations section of the report states that the purpose of the Stage 2 survey will be to "confirm the presence or absence of archaeological resources that could represent potential constraints for the proposed development. In the event that any sites are discovered or otherwise confirmed that may represent significant planning concerns, it is also recommended that measures for mitigating the concern or concerns be implemented. Options include preservation by avoidance or mitigation by salvage excavation in advance of development" (D.R. Poulton and Associates Inc., 2009). The MCL concurred with the recommendations of the archaeologist.

3.5.6.2 Stage 2 Archaeological Assessment of the Proposed Gesner (Highgate) Wind Power Development, Orford Geographic Township, Municipality of Chatham-Kent, Ontario

Hatch contracted Mayer Heritage Consultants Inc. in May 2010 on behalf of Saturn Power to undertake a Stage 2 archaeological assessment of lands potentially impacted during the construction of the proposed Gesner (Highgate) Wind Power Development. This Stage 2 Archaeological Assessment was completed in accordance with the technical guidelines for archaeological assessment formulated by the Ministry of Culture, the purpose of which was to "to determine if any direct and/or indirect impacts would occur by proposed construction activities for the location of Wind Turbines on archaeological resources that might be present" (Mayer Heritage Consultants Inc., 2010). A copy of this Stage 2 Archaeological Assessment is included as Appendix E.

This Stage 2 investigation consisted of both shovel test pit and pedestrian survey methods. No archaeological artifacts were recovered during the course of this Stage 2 investigation on site. Based on this conclusion, the archaeologist has recommended that no further work is required prior to development of the site.

Subsequent to the completion of the initial Stage 2 archaeological Assessment, a change in the Project location was identified. Hatch contracted Mayer Heritage Consultants Inc. in May 2011 on

behalf of Saturn Power to undertake a Stage 2 archaeological assessment of new areas of land potentially impacted during the construction of the proposed Gesner (Highgate) Wind Power Development. This Stage 2 Archaeological Assessment was completed in accordance with the technical guidelines for archaeological assessment formulated by the Ministry of Tourism and Culture. A copy of this Stage 2 Archaeological Assessment is included in Appendix E.

This Stage 2 investigation consisted of pedestrian survey methods. No archaeological artifacts were recovered during the course of the Stage 2 investigation on site. Based on this conclusion, the archaeologist has recommended that no further work is required prior to development of the site.

3.5.6.3 Built Heritage and Cultural Heritage Landscapes

Hatch was then directed by the Ministry of Culture to complete the *Ministry of Culture – Check Sheet for Environmental Assessments: Screening for Impacts to Built Heritage and Cultural Heritage Landscapes*. This Check Sheet is intended to help identify potential cultural heritage resources, determine how important they are and indicate whether a cultural heritage impact assessment is needed.

Upon completion of the Check Sheet it was confirmed with the MCL that a Built Heritage and Cultural Heritage Landscape Assessment was not required due to the absence of any triggers. The completed *Ministry of Culture – Check Sheet for Environmental Assessments: Screening for Impacts to Built Heritage and Cultural Heritage Landscapes* was submitted to the Ministry of Culture on December 4, 2009 and is included as Appendix D.

3.5.7 Resources used for Traditional Purposes by Aboriginal Persons

As discussed within the Consultation Report, no comments from Aboriginal communities have been received regarding the use of resources for traditional purposes in the vicinity of the Project, nor on the potential effect of the Project on any aboriginal lands or resources. All of the Project location is on privately owned land.

3.5.8 Infrastructure

3.5.8.1 Transportation

As illustrated in Figure 1.1, Highway 401, a provincial highway, is located approximately 2 km northwest of the Project location. Highway 3 is located approximately 3 km south of the Project location. Both highways run parallel to the Lake Erie shore.

An abandoned CNR corridor runs in a southeast to northwest direction in the vicinity of the Project south and east of Highgate.

Via Rail passenger service is available from stations in Chatham and Glencoe, located north of the Project. Glencoe is the closest station; approximately 30 km from the Project location.

The closest Canadian international airports are the Windsor Airport (approximately 100 km west-southwest) and the London International Airport (approximately 100 km northeast). Across the border, the nearest American International Airport is the Detroit Metropolitan Airport in Michigan. The Chatham-Kent Municipal Airport provides instruction services as well as chartered rental and can accommodate corporate aircraft.

There are two small abandoned airfields within 10 km of the study area. One of the airfields is located approximately 6 km away, north of Rodney. The other airfield is approximately 5 km north of the study area, on the north side of Highway 401.

Seasonal ports in the closest vicinity are located in Windsor and Sarnia, 82 km and 80 km from Chatham-Kent respectively.

3.5.8.2 Waste Management and Disposal Sites

Residential refuse and recycling collection is provided by the municipality of Chatham-Kent. In the vicinity of the Project, rural waste collection and recycling transfer stations would play a key role in waste disposal. Two landfills are located within the municipality. Ridge Landfill on Erieau Road and Blenheim Landfill on Base Road are both located in Harwich. Harwich is located approximately 20 km southwest of the Project location (Municipality of Chatham-Kent, 2008).

3.5.8.3 Water Supply and Delivery/Wastewater

There are 10 wastewater treatment facilities in the municipality of Chatham-Kent. The closest facility in proximity of the Project is the Ridgetown Lagoons which is a "New Hamburg" type of treatment facility with an average daily flow of 2844 m^3/d, and a maximum capacity of 3074 m^3/d (Municipality of Chatham-Kent, 2008).

3.5.8.4 Power Supply and Distribution

Natural gas transmission, storage and distribution within the municipality are provided by Union Gas. Electrical service is provided by HONI. In the Ridgetown area, in the vicinity of the Project, service charges for residential distribution were $14.48, while the distribution volumetric rate was 0.0150 $/kWh. A 27.6-kV distribution line is located along the railway in the vicinity of the Project (Municipality of Chatham-Kent, 2008).

3.5.8.5 Existing Generating Stations

According to the 2008 Community Profile for the Municipality of Chatham-Kent "Wind Projects are a growing opportunity for the rural sector. Kruger Energy's 100-MW Port Alma project has started construction and targets the fall of 2008 for completion. GenGrowth has four Chatham-Kent projects accepted in the Ontario Power Authority's Standard Offer Contract (SOC) and are just completing the Environmental Screening Process. Several other wind developers are in various stages of development. Opti-Solar announced a 450-acre 40-MW project in the Tilbury area" (Municipality of Chatham-Kent 2008).

3.5.8.6 Emergency and Medical Services

Police services are deployed out of four districts: Chatham, Ridgetown, Wallaceburg and Tilbury. Various local offices are located throughout the municipality offering the following services: traffic enforcement, community patrol, investigative support, etc. In addition, the Ontario Provincial Police (OPP) provides various specific policing services throughout the municipality. The OPP are also responsible for enforcing traffic on Highway 401 and Highway 40, in addition to marine policing (Municipality of Chatham-Kent, 2008).

There are 19 fire stations within the municipality with more than 400 firefighters. The Chatham-Kent Fire Department is comprised of four divisions: Fire Prevention/Public Education Division, Training/Professional Development Division, Operations, and the Administrative Division.

Ambulance services in the Municipality of Chatham-Kent are provided by the Chatham-Kent Division of the Sun Parlour Emergency Medical Services. The local emergency medical service base is located in Ridgetown. Clinical care and emergency service is provided by the Chatham-Kent Health Alliance.

3.5.9 Existing Sound Levels

The points of reception in the vicinity of the Project are considered to be Class 3 areas (rural). There is no industrial activity within 1000 m. The Project location is located nearby an unused railway, and about 4 km southeast of Highway 401. At this distance, the traffic noise from the highway is insignificant. Existing sound levels are discussed in Section 3.5 of the Acoustic Assessment Report (Appendix A).

3.5.10 Visual Landscape

The existing visual landscape of the Project location is one characterized by gradual relief; cultivated for agricultural purposes. The area is dotted with houses, barns and associated outbuildings with woodlots and tree lines also contributing to the landscape. The physiography and topography is discussed in Section 3.1.1. Photo montages at various locations, showing the study area are discussed in Section 4.4.7.1.1.

4 Project Activities, Environmental Impacts, Mitigation Requirements and Residual Effects

4. Project Activities, Environmental Impacts, Mitigation Requirements and Residual Effects

This section describes the activities that will occur during construction and operation of the Project, the anticipated environmental effects, mitigation measures proposed to minimize/eliminate adverse effects and the net (residual) effects following implementation of mitigation. The significance of any net residual adverse effects is assessed in Table 4.3 (Page 4-51).

4.1 Project Construction and Installation Phase Activities

This section details the activities that will occur on site during the construction and installation phases of the Project. Potential impacts to the environment as a result of, and mitigation measures to be employed, during this phase are detailed in Sections 4.3 and 4.4.

4.1.1 Access Road Construction

Approximately 3.3 km of new, permanent access roads on private land will be required to allow transport of equipment and turbine parts from the main roadways within the study area to each turbine location. Topsoil will be removed from the locations of proposed access roads prior to the deposition of granular material, and stored on site for use elsewhere. A geotextile fabric will then be placed along the access road course to prevent the mixing of gravel and soils. The minimum thickness of the access road granular base and top course material will be 30 cm. Roadways will be constructed to a 9 m width during construction; this will be reduced to a 3 m width during the operations period.

The proposed new access road to WTG 2 will cross Peets Drain and a culvert will be required (see location in Figure 4.1). A municipal permit will be required to construct this culvert crossing. No other watercourses will be crossed by the proposed access roads. The new access road to WTGs 4 will run within 30 m of a portion of Jenson Drain.

4.1.2 Site Preparation and Foundation Excavation

Prior to arrival of wind turbine parts on site, each wind tower foundation must be prepared. This involves levelling of an approximate 40-m diameter area at the base of each wind tower for turbine assembly and crane pads. Reinforced concrete foundations are expected to be 20 to 24 m diameter and will be excavated to a depth of 3 to 4 m. Therefore, the total amount of excavated material requiring disposal will be approximately 1330 m^3 for each turbine. Landowners will be consulted at the time of construction to determine whether fill material can be used on site. If no on-site use can be found, disposal will be at an approved, licensed off-site location. If disposal is proposed within a floodplain or other hazard lands, it will first be approved by the Lower Thames Valley Conservation Authority.

4.1.3 Topsoil Conservation

Where practicable, topsoil will be stripped from temporary work locations and access roads, and stored adjacent to the disturbed area while ensuring that any drainage courses present are not blocked. When the temporary works are removed following completion of construction, topsoil will be replaced. If topsoil is not stripped, the agricultural crops will be left uncut, or shredded and left

on the soil surface over the entire working area to provide some protection of the topsoil. Mitigation measures to protect soil quality are described further in Section 4.3.2.

4.1.4 Transport of Equipment and Concrete

The wind turbine generators will be purchased from a supplier in Europe with manufacturing facilities in both Europe and the US; therefore, ocean transport of nacelles and blades may be required to a nearby port, or they will be transported by truck from the US. The location of the port and/or border crossing is to be confirmed depending on the equipment point of origin. The tower sections would then be forwarded to the site by truck. It is anticipated a single turbine will require approximately 17 truckloads, therefore, up to 60 truckloads (as some of the components can be transported with multiple components per truckload) will be required. For each turbine, three separate 45-m (approximate) long rotor blades, as well as the nacelle, hub and associated pieces, would be expected to be transported by ship. It is anticipated that the transport of equipment will be a phased process occurring over a 3-week period.

Approximately 55 to 65 truckloads of concrete will be required to form each tower base. Therefore, up to 325 truckloads of concrete will be needed.

A permit will be required from Chatham-Kent, Essex and Elgin counties for transportation of overweight/oversize loads. Appropriate permission will be required from any other jurisdiction through which oversize loads will be travelling.

4.1.5 Underground Cable Installation

Underground cables will be required to connect the turbines. A simple trenching device can be used to install the cable, whereby an approximately 5-m wide slot is opened, the cable laid, and the soil replaced. The cable will be placed below the level of the drainage tiles. Disturbed drainage tiles will be replaced. It is currently estimated that approximately 3300 m of cable will be required for the Project.

4.1.6 Distribution Line Erection

A 27.6-kV distribution line will be erected to transport generated power from the facility to the 27.6-kV connection point on the distribution line immediately east of McPherson Road. The distribution line will be installed on wooden poles along the existing roadways within the study area. The distribution line will be constructed and operated by HONI, and as such is not considered and approved outside of the REA process.

4.1.7 Turbine Erection

Wind turbines will be erected with the use of cranes. Therefore, a temporary crane pad will be required adjacent to each foundation. The surface and base of the crane pad will be the same as that proposed for the temporary construction works/laydown area (detailed in Section 4.1.2). Crane pads will be approximately 600 m^2 (20 x 30 m).

4.1.8 Heavy Equipment

Heavy equipment will be required on site during the construction period. The exact equipment to be brought on site will be determined by the construction contractor; however, at this time it is anticipated that at minimum, the following equipment will be required:

- concrete trucks
- dump trucks
- transport trucks
- excavators
- bulldozers
- compactors
- cranes.

4.1.9 Resource/Material Requirements

4.1.9.1 Energy and Water Requirements and Sources

On-site energy requirements during construction are to be provided by portable diesel generators.

Water will be required during the construction process (i.e., wash water, etc). Water will be sourced from off-site commercial water delivery operations. It is not anticipated that water will be withdrawn from any local watercourses for use during the construction process. If the contractor does require water from local watercourses, the tender specifications will require them to obtain a Permit to Take Water from the MOE if the withdrawal has the potential to be in excess of 50,000 L/d.

4.1.9.2 Borrow Materials

Borrow materials (to Granular 'A' and Granular 'B' specifications) will be required for construction of the access roads. These materials will be obtained from a local supplier to be identified in a later phase of design. The exact amount required is to be determined and the location for taking of borrow materials will be approved by MNR.

4.1.9.3 Concrete

Concrete will be sourced from an off-site ready-mix supplier and brought on site by concrete delivery trucks. As previously described in Section 4.1.4, up to 325 truckloads of concrete will be needed.

4.1.9.4 Toxic/Hazardous Materials

Fuels, hydraulic fluids, and lubricants will be used in equipment during construction and operation of the facilities. The fuel storage facility will comply with all current regulations and guidelines. The storage of small amounts of hydraulic fluids and lubricants will be in a contained area, well away from any watercourse. The personnel handling toxic/hazardous materials should be trained in WHMIS and appropriate occupational health and safety practices.

It is not anticipated that explosives will be required. If required, it is not anticipated that they will be manufactured on site. Explosives stored on site will be contained in a manner compliant with NRCan requirements and industry standards. Explosives will be transported in accordance with Transport Canada requirements (e.g., Transportation of Dangerous Goods Act).

4.1.10 Waste Disposal

No gaseous wastes other than construction equipment emissions are anticipated. Industrial liquids such as paints, sealants, fuels, and lubricating fluids will be stored in a secure containment area and disposed in accordance with provincial liquid waste disposal regulations (e.g., Environmental Protection Act and Ontario Regulation 347).

Solid wastes generated during construction will include domestic waste such as food and sanitary waste and construction waste such as material packaging and scrap material. Sanitary facilities on site must include portable self-contained toilets. All solid and sewage wastes must be contained and hauled off site by a designated hauler throughout the construction period. Any waste that can feasibly be reused or recycled will be. All municipal waste must be transported to an MOE licensed landfill by an MOE licensed hauler.

4.1.11 Communications and Emergency Response Plans (Construction)

A Communications Plan will be developed by Saturn and the chosen contractor during construction to facilitate coordination with local authorities (municipality, conservation authority, relevant ministries of the Ontario government, emergency services), the public, and aboriginal communities to provide them information about the ongoing activities. This plan will, at minimum, include the following details:

- signs to be posted where required to give information to the local public and visitors
- contact information to seek more information and report emergencies and complaints, including a toll-free number, an e-mail and a full mailing address will be posted at a strategic public location
- maintaining a record of any contact received in relation to the Project, including
  - name, address and telephone number of the contact
  - time and date of the contact
  - details of the contact
  - if a complaint/emergency - actions to taken to remediate the concern and prevent recurrence.

In addition to the above, Saturn may use local newspaper and/or media to update the project specific news to the general public.

An Emergency Response Plan will be developed by the chosen contractor for the construction phase of the Project. This plan will be submitted to the municipality, MNR, MOE, EC, and LTVCA prior to the start of construction. This plan will, at minimum, include details identifying

- procedures to be followed in case of an emergency
- notification requirements upon the event of an emergency

- contact information for representatives of the construction contractor and Saturn.

4.1.12 Schedule

It is estimated that the construction phase of the Project will take up to 6 months. This includes preparation of the site, construction of roads and foundations, erection of the five wind turbines, and completion of all connections to the distribution grid. Construction is anticipated to commence in July 2011, and will be completed by the end of 2011. The anticipated schedule for construction by activity is provided in Table 4.1.

Table 4.1 Anticipated Construction Schedule

Construction Activity	Anticipated Schedule
Access Road Construction	July 2011
Site Preparation and Foundation Excavation	August 2011
Underground Cable Installation	August 2011
Turbine Erection	August 2011 to October 2011

All activities will be conducted in accordance with the Municipality of Chatham-Kent Noise By-law (By-law No. 41-2004). This by-law restricts the timing of construction to being from 7:00 a.m. to 11:00 p.m., Monday through Saturday (excluding statutory holidays), unless an exemption is provided by the Municipality.

4.2 Project Operation Phase Activities

This section details the layout of the Project, and activities that will occur on site during the operations phase. Potential impacts to the environment as a result of, and mitigation measures to be employed, during this phase are detailed in Sections 4.3 and 4.4.

A site plan of the proposed facilities in relation to the existing infrastructure and environmental features of the study area is shown in Figure 4.1, and with a 300 m buffer in Figure 4.2.

4.2.1 Project Specifications

4.2.1.1 Wind Turbine Specifications

Two Gamesa G-97 and Three Gamesa G-97W wind turbines will be erected as part of the project. Specifications of the wind turbines selected for the Project were described earlier in Section 1.3.

4.2.1.2 Other Infrastructure Specifications

Specifications for other infrastructure, such as the distribution line and access roads, were described in Section 4.1.

4.2.2 *Wind Turbine Operation Regime*

The wind turbines will operate year round, depending on daily weather conditions. A minimum wind speed of 3 m/s is required for the turbine to be operational. In the case of the Gamesa G97 and G97W 2-MW wind turbines, the generator reaches its maximum potential (i.e., 2 MW) at a wind speed of 15 m/s, and the rotor will stop spinning at a wind speed of 25 m/s to avoid damaging the equipment. The turbines are rated for operation in temperatures as low as -30°C, but will automatically shut down in freezing rain conditions when there is an ice load on the blades. Each rotor, with a total diameter of 97 m, will sweep an area of 7390 m^2. The turbines will be appropriately designed to perform under varying weather conditions.

4.2.3 *Maintenance and Inspection*

The turbines will typically be scheduled for preventative maintenance at 3 months after commissioning and then every 6 months thereafter. Typically, maintenance on one machine can be completed within 1 working day. The turbines will also be inspected whenever the power output is lower than anticipated as this would be indicative of a mechanical problem. Power output will be monitored remotely by a Selective Control and Data Analysis (SCADA) system.

All the required maintenance materials (e.g., hydraulic fluids) will be brought to the site as required so no on-site storage of these materials will be necessary. All waste industrial liquids generated during maintenance activities will be transported off site, by a designated waste hauler (if required) to a designated disposal site.

Environmental monitoring plans to be employed during the operations phase of the Project are described in Section 6.

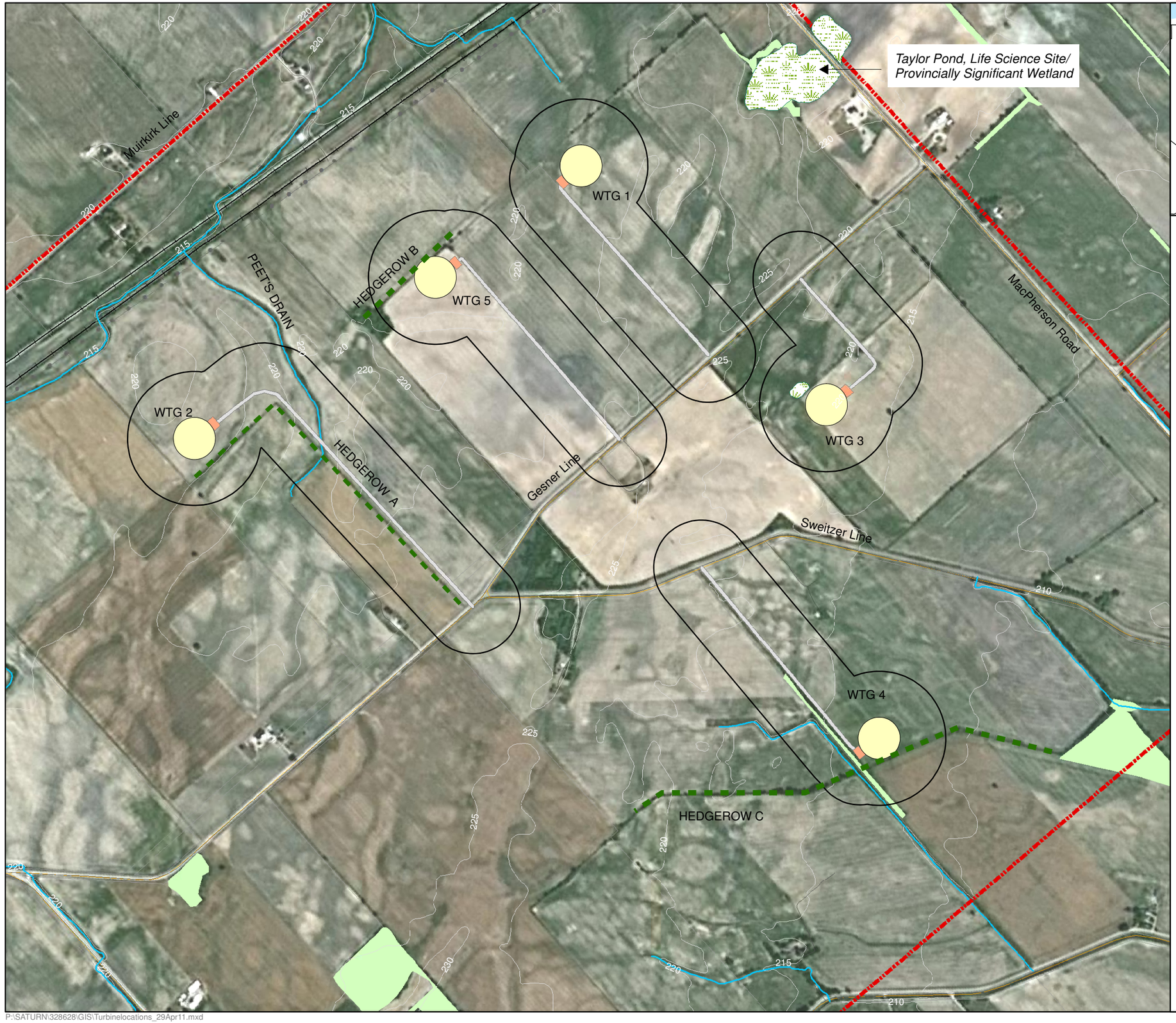
4.2.4 *Communications and Emergency Response Plans (Operations)*

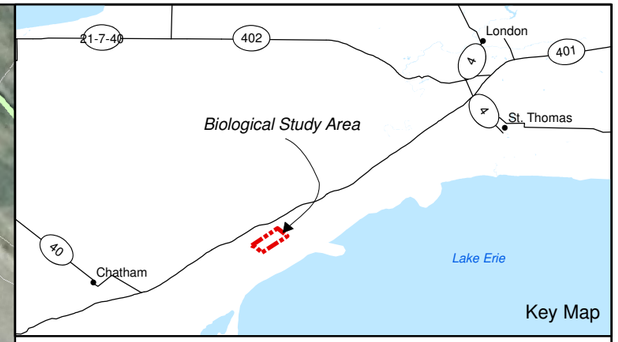
Similar to those that were developed for construction (see Section 4.1.11), emergency response and communications plans will be developed by Saturn prior to the start of operations and submitted to the stakeholders.

The communications plan will, at minimum, include a sign to be posted to give information to the local public and visitors. This sign will include contact information to seek more information and report emergencies and complaints, including a toll-free number, an e-mail and a full mailing address will be posted at a strategic public location. Any contacts received in relation to the Project will be documented in a record that will include

- name, address and telephone number of the contact
- time and date of the contact
- details of the contact
- if a complaint/emergency – actions to taken to remediate the concern and prevent recurrence.

An Emergency Response Plan will be developed by Saturn for the operations phase of the Project. This response plan will build upon that established by the chosen contractor for the construction period, and will be submitted to the municipality, MNR, MOE, EC, and LTVCA prior to the completion of construction. This plan will, at minimum, include details identifying:





Legend

Project Components

- Wind Turbines (110 m Diameter)
- Crane Pad
- Access Road (9 m Width)
- 120 m from Project Components

Natural Features

- Biological Study Area
- Wetlands
- Woodland
- Hedgerow

Notes:
1. Base data downloaded from www.geographynetwork.ca NRVIS data from MNR LIO.
2. Spatial referencing UTM NAD 83
3. Satellite imagery from Google Earth Pro.

0 50 100 200 Metres
1:10,000

NORTH

Figure 4.1
Saturn Power Inc.
Gesner Wind Energy Project
Project Location in Relation to Natural Features

HATCH

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Taylor Pond, Life Science Site/
Provincially Significant Wetland

Muirkirk Line

Abandoned CN Rail Corridor

PEET'S DRAIN

HEDGEROW B

HEDGEROW A

HEDGEROW C

HEDGEROW D

Gesner Line

Sweitzer Line

MacPherson Road

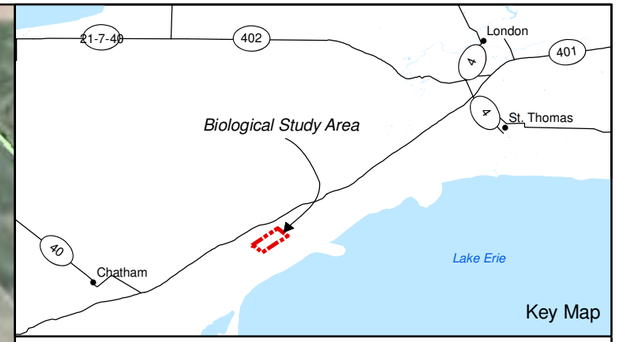
WTG 1

WTG 2

WTG 3

WTG 4

WTG 5



Legend

Project Components

- Wind Turbines (110 m Diameter)
- Crane Pad
- Access Road (9 m Width)
- 300 m from Turbines Components

Natural Heritage Features

- Building
- Biological Study Area
- Wetlands
- Woodland
- Hedgerow

Notes:
1. Base data downloaded from www.geographynetwork.ca NRVIS data from MNR LIO.
2. Spatial referencing UTM NAD 83
3. Satellite imagery from Google Earth Pro.

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NORTH

Figure 4.2
Saturn Power Inc.
Gesner Wind Energy Project
Project Location

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- procedures to be followed in case of an emergency
- notification requirements upon the event of an emergency
- contact information for representatives of Saturn.

4.3 Natural Environmental Impact Assessment

The impact of construction and operation of the Project on the various environmental components are outlined in the following sections.

4.3.1 Physiography/Topography

4.3.1.1 Construction

In order to construct branch roads, turbine pads, substation, etc, and as a result of the regrading of excavated soils, some minor alterations to local topography will occur. Regrading will be kept to a minimum and local drainage patterns and existing topography will be considered so that no major alterations to these features occur.

4.3.1.2 Operations

There will be no impact on physiography/topography as a result of operations.

4.3.1.3 Residual effects

Given the minor amount of regrading required and the negligible effect that this is anticipated to have on the local physiography/topography, no residual effect is expected to occur.

4.3.2 Soils

4.3.2.1 Construction

Soils could be potentially affected by excavations, stockpiling of materials, and sedimentation or erosion processes. These issues are addressed below with respect to soil displacement, soil quality, and sediment and erosion control.

4.3.2.1.1 Soil Displacement

Removal of surficial materials will occur during excavation and site preparation for turbine foundations, branch road construction, and burying of interconnection cables. The extent of soil removal will be minimized to the greatest extent possible. All stripped and excavated surficial materials will be separated into topsoil and subsoil, and then stockpiled on site for storage. These excavated earth and organic materials will be reused on site in areas to be rehabilitated and revegetated following construction to the greatest extent possible. Thus, none of the surficial materials are to be removed from the local environment.

4.3.2.1.2 Soil Quality

Soil quality could be impaired through stockpiling of excavated materials, addition of gravel for temporary road bases or work areas, or compaction of soil as a result of the presence of heavy machinery or material stockpiles.

Stockpiling of excavated materials may result in the development of anaerobic conditions or mixing of topsoils and subsoils. In order to mitigate these potential effects

- excavated topsoil and subsoil are to be stockpiled separately to avoid intermixing
- the duration of stockpiling is to be minimized to the greatest extent possible through appropriate phasing of construction
- the depth of topsoil stockpiles is to be limited to the greatest extent possible, with depths preferably restricted to <1 m. Stockpiling to depths >1 m may result in adverse effects on the health of the soils at the base of the stockpile (Harris and Birch, 1989; cited in Strohmayer, 1999).

The use of gravel or granular materials as a base for temporary work areas or access roads could result in the mixing of these materials with underlying soils, potentially impacting soil structure and/or texture, infiltration of surface water, and vegetation growth. Mitigation measures to prevent this effect include

- topsoil to be stripped from locations of temporary access roads or work areas and stockpiled, as described above, until it can be replaced after construction
- following the stripping of the topsoil and prior to the deposition of the gravel base, a layer of geotextile fabric will be placed over the entire area to prevent mixing of gravel with the soils.

Soil compaction occurs when heavy equipment or stockpiled material causes the soil particles to be pushed together, thereby increasing soil density and reducing the pore space within the soil structure (DeJong-Hughes et. al., 2001). Excessive soil compaction can result in inhibited vegetation growth by impeding root penetration within the soil, reducing aeration, and altering moisture intake (i.e., decreased infiltration due to decreased pore space within the soil structure) (DeJong-Hughes et. al., 2001). Decreased water infiltration into the soil could also potentially result in an increase in surface runoff which could increase soil erosion. In order to minimize the amount of compaction that occurs around the construction site, the following mitigation measures are identified:

- all equipment and stockpiles will remain within identified work areas
- prior to site rehabilitation, disturbed areas will be visually monitored to assess if compaction has occurred, as noted by rutting or flattened areas beneath stockpiles. Restoration efforts (e.g., discing or other soil loosening methods) will be undertaken as required to prevent significant long-term impacts due to excessive amounts of compaction.

Soil quality could also be impacted by accidental spills of contaminants; mitigation and restoration measures identified in the Accidents and Malfunctions section relating to spills (see Section 4.6) will be effective at preventing impacts on soil quality.

Mitigation measures identified above with respect to stockpiling of materials, deposition of gravel, and soil compaction are anticipated to be effective at minimizing potential impacts on these features. Some minor, localized deteriorations in soil quality may occur as a result of the above activities, which would have an impact on revegetation efforts. In order to ensure that adequate revegetation is occurring on the impacted areas, monitoring will be conducted following final site restoration (see

Section 6). Remedial action to restore soil quality in impacted areas will be undertaken as deemed necessary to ensure that revegetation efforts are successful.

4.3.2.1.3 Sediment and Erosion

In addition to excavation, surficial soils will also be disturbed throughout the construction sites due to vegetation clearing (where required), topsoil and subsoil stripping, grading and use of heavy machinery. These activities have the potential to increase soil erosion due to exposure of bare soil (not protected by vegetation) to the effects of rain or wind. Erosion is defined as the process where individual soil particles are detached from the ground, whereas sedimentation is defined as the subsequent transport and deposition of the detached soil particles. In order to mitigate this potential, mitigation measures are proposed below which should be supplemented by a sediment and erosion control plan, including a drawing showing locations of proposed measures, prepared by the proponent's engineer or contractor.

Preventing erosion from occurring will be the primary goal of an erosion and sedimentation control plan, to be prepared by the construction contractor. The main mitigation measures that will form the basis for the sediment and erosion control plan will include

- all necessary erosion and sediment control measures must be in place prior to the start of any earthworks, and are to remain in place until all areas of the construction site have been stabilized. All erosion and sediment control measures are to be installed and maintained in accordance with Ontario Provincial Standards Specification 577.
- an adequate supply of erosion (e.g., geotextiles, revegetation materials) and sediment (e.g., silt fences) control devices is to be provided on site to control erosion and sedimentation and respond to unexpected events.
- the size of the disturbed areas at the construction site is to be minimized. The extent of the work area is to be demarcated on the site to ensure that the contractor does not work beyond these bounds.
- phase construction to minimize the time that soils are exposed.
- revegetate/stabilize slopes as soon as possible after exposure. Revegetation should occur by midsummer if possible.
- excavated erodible material stockpiles are to be graded to 2:1 (horizontal to vertical) and placed in suitable designated areas away from the river or other watercourses (i.e., outside the floodplain, away from drainage channels) and properly constructed silt fences should be installed around the stockpiles to limit the transport of sediment.
- sediment traps are to be placed along all drainage runs from the site and silt fence barriers, or other appropriate sediment control measures, are to be installed and maintained below all disturbed areas where needed and effective.
- sediment control measures will be used during any dewatering of open excavations.

Implementation of these mitigation measures is anticipated to be effective in minimizing soil erosion and off-site transport from the construction area. All sediment and erosion control measures will be

regularly inspected to ensure that they are functioning properly and are maintained, repaired and/or upgraded as required. If the sediment and erosion control measures are not functioning properly, no further work will occur until the sediment and/or erosion problem is immediately addressed. Further details of the monitoring program are described in Section 6.

4.3.2.2 Operation

It is not anticipated that there will be any impact on soils during operations. All routine maintenance work will be conducted from the existing road surfaces and no excavations are anticipated.

Should maintenance equipment need to be moved off existing road surfaces, or if excavations are required, standard soil compaction, and erosion/sediment control measures are to be employed as during construction (see Section 4.3.2.1.2).

4.3.2.3 Residual Effects

No residual effects are anticipated with respect to soil quality or erosion/sedimentation of soils. Potential impacts identified above will all be temporary in nature and following effective use of mitigation measures and site restoration efforts, there will be no lasting deterioration of local soil quality or loss of soils from erosion associated with the Project.

4.3.3 Aggregate Resources

During construction, there will be minor intrusion on the area identified as consisting of medium aggregate potential. This is a relatively small portion of the potential aggregate availability within the area, and the loss of this potential is not expected to impact availability of aggregate resources. There are therefore no anticipated adverse residual effect on aggregate resource availability within the local area.

4.3.4 Surface Water Quality

4.3.4.1 Construction

Activities that could occur during the construction phase that would have the potential to affect surface water quality in drainage routes and nearby watercourses include

- increased erosion and sedimentation from the construction area
- dust generation
- accidental spills of fuels
- accidental spills of concrete
- water crossing installation.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.3.4.1.1 Increased Erosion and Sedimentation

Disturbance of the Project location due to vegetation clearing, topsoil and subsoil stripping, grading, excavation of turbine foundations areas, use of heavy machinery, stockpiling, construction of access roads and installation of a water crossing on Peets Drain have the potential to increase soil erosion

due to exposure of bare soil (not protected by vegetation) to the effects of surface water (e.g., rain, overland flow due to rain/snow melt). Erosion is defined as the process where individual soil particles are detached from the ground, whereas sedimentation is defined as the subsequent transport and deposition of the detached soil particles. Erosion and sedimentation have the potential to affect surface water quality by resulting in higher levels of turbidity and possibly contaminants associated with the soil surface in receiving waterbodies.

In order to mitigate this potential, a conceptual erosion and sediment control (ESC) plan is proposed below which should be supplemented by an ESC drawing prepared by the proponent's engineer or contractor.

Preventing erosion from occurring in the first place is the primary goal of the ESC plan and measures such as proper construction phasing, minimizing the size and duration of soil disturbance and exposure and revegetating or stabilization as soon as possible after disturbance are all identified as effective erosion control measures. Sediment control measures are the last line of defence and are implemented to ensure that eroded soil particles are not transported off the Project location or to watercourses. Sediment control measures include measures such as silt fence barriers to trap and retain sediments.

The main mitigation measures that will form the basis for the ESC plan will include the following:

- Minimize the size of the cleared and disturbed areas at the construction site (e.g., WTG sites and access road areas). Install limit of work devices to prevent the contractor from operating outside the defined construction area, if necessary.
- Phase construction to minimize the time that soils are exposed.
- Limit vegetation removal to existing agricultural fields. Limit of work devices should be installed outside the drip line of residual trees, where construction is to occur in close proximity.
- An adequate supply of erosion control devices (e.g., geotextiles, revegetation materials) and sediment control devices (e.g., silt fence barriers) to be provided on site to control erosion and sedimentation and respond to unexpected events.
- Sediment control fencing may be installed along the periphery of the Project location where there is the potential for sedimentation off site. These silt fence barriers should remain in place until construction is complete and site vegetation, and other long-term protection measures are stabilized and adequate to prevent further erosion.
- Grade stockpiles to a stable angle as soon as possible after disturbance to eliminate potential slumping. Revegetation (if during the growing season) or some other means of stabilization (e.g., tarping) should occur for any disturbed surface that is to be left exposed for longer than 30 days.
- Excavated erodible material stockpiles to be placed in suitable designated areas away from waterbodies and drainage routes and properly constructed silt fence barriers should be installed around the stockpiles to limit the transport of sediment.
- Monitoring the tracking of mud onto local streets during construction. If mud on streets occurs, the contractor will be required to implement a system to prevent transfer of this material to local ditches and waterbodies. This could potentially include wheel washing areas at the exit from the

construction site or end-of-day street sweeping/scraping to remove accumulated materials from local streets.

Implementation of these mitigation measures is anticipated to be effective in minimizing soil erosion and off-site transport from the construction area, such that waterbodies are not negatively affected. Monitoring will be conducted throughout the construction period to ensure ESC measures are functioning as designed.

4.3.4.1.2 Dust Generation

Dust may be mobilized due to vehicular traffic and heavy machinery use and soil moving activities (e.g., excavation, trenching). If unmitigated, excessive dust levels could adversely impact surface water quality and aquatic habitat if it were to be deposited in waterbodies.

However, it is not anticipated that dust generation will be a significant problem since the potential impacts can be substantially mitigated through the use of standard construction site best management practices and mitigation measures, as discussed in Section 4.3.13.1.

Visual monitoring of dust generation will occur during the construction period and if dust is observed to be of concern, additional mitigation will be implemented. Given the mitigation and monitoring proposed, it is anticipated that dust generation will be relatively low in magnitude and limited in duration and geographical area, such that no negative effects on water bodies occur as a result of dust.

4.3.4.1.3 Accidental Spills

Fuels, lubricants and other hazardous materials will be used on the construction site. Activities during the construction phase that could potentially result in transport of these materials to the watercourse, with subsequent negative impacts on water quality, include

- refuelling and maintenance of equipment on site
- use of equipment containing fuels, lubricants or other materials within, or in the vicinity of watercourses
- storage of hazardous materials on site.

There are a number of general mitigation practices to be followed by the contractor during construction to minimize the potential for negative environmental impacts associated with the scenarios above which could be caused by the storage, use and disposal of fuels, lubricants and other hazardous materials. These include the following:

- Establish designated refuelling and maintenance areas at least 30 m from waterbodies, drainage ditches, channels or other wet areas.
- Locate designated hazardous material storage areas in laydown areas at least 30 m away from waterbodies, for all hazardous materials to be stored outside. Storage areas should be above ground and enclosed by an impervious secondary containment structure (e.g., berm or container) capable of holding the entire volume of the stored material, as well as some additional volume of rainwater. The area should be equipped with a drain so that it can be cleared of any spilled material or accumulated rainwater, which would be disposed of in a suitable manner.

Secondary containment areas should be monitored throughout the construction period to ensure their integrity.

- A barrier will be erected around the storage area to prevent accidental damage to containers.
- Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- An emergency spill kit will be kept on site in case of fluid leaks or spills from machinery.
- Provide adequate spill clean-up materials/equipment (e.g., absorbents) on site. The contractor must have a spill clean-up procedure/emergency contingency plan in place prior to commencement of work at the site. All site staff should be trained in implementation of the procedure.

Given this mitigation, no adverse effects on surface water quality due to use of fuels, lubricants and other hazardous materials during Project construction is anticipated to occur.

4.3.4.1.4 Accidental Spills of Concrete

Concrete will be used for each wind turbine base. Concrete will be brought on site by a ready-mix concrete supplier in concrete trucks and poured directly into the form for each turbine base. No cement is anticipated to be stored or mixed on site.

Concrete, grout and associated materials (e.g., cement, mortars) typically have high pH values (i.e., highly basic or alkaline), which, if they enter a watercourse, could create adverse surface water quality conditions that are toxic to aquatic biota (Province of British Columbia, 2007).

Although the use of concrete during Project construction is relatively limited and will not occur within 30 m of any water body, mitigation measures are proposed to prevent negative effects. The Province of British Columbia (2007) has identified a number of construction best management practices to prevent adverse impacts on surface water quality and biota due to the use of concrete. Therefore, in order to mitigate potential adverse effects due to concrete and cement use, the following mitigation measures are to be implemented:

- No alkaline cement products will be deposited directly or indirectly into or adjacent to any watercourse.
- Concrete truck rinsing will occur at a designated area at least 120 m from any waterbodies or drainage routes in a manner to contain the rinse water and concrete residue to prevent off site transport.
- No cement is anticipated to be stored on site. However, if some cement bag storage is required, bags are to be stored indoors, where possible. If outdoor storage is required, cement bags should be covered with waterproof sheeting and raised from the ground surface (e.g., on wooden palates) to ensure no contact with surface water runoff. Impervious material will be placed under the elevating mechanism to collect any spills (e.g., due to ripped bags). Empty cement bags are to be collected as soon as possible after use and spills of cement or concrete cleaned up as appropriate.

Given this mitigation, no negative effects on surface water quality due to use of concrete during construction is anticipated to occur.

4.3.4.1.5 Water Crossing Installation

As noted previously, the proposed access road to WTG 2 will cross Peets Drain. Construction of the access road and water crossing have the potential to result in adverse effects on surface water quality due to erosion and sedimentation as well as to aquatic habitat and biota (see Section 4.3.6).

Typical mitigation measures that could be employed include

- sediment and erosion controls should be in place prior, during and following to construction, until revegetation is stabilized and adequate to protect from erosion
- culvert installation will be conducted in a dry condition behind instream cofferdams, with flow being pumped or otherwise diverted around the work area
- the access road should be aligned at 90 degrees to the watercourse to limit the size of the footprint of the access road in the watercourse and buffer area
- culvert installation will occur during low flow periods
- heavy construction machinery use on the stream bed, if necessary, will be limited to the extent possible and only in the dewatered area behind cofferdams
- all disturbed areas will be revegetated as soon as possible to limit erosion. If vegetation is not possible other stabilizing methods should be used to limit erosion (e.g., erosion matting, bioengineering)
- riprap should be placed on the upstream and downstream fill slope around the culvert inlet to prevent erosion of fill.

The potential for adverse effects on surface water quality will be minimized through the use of these techniques, which will be finalized during the detailed design process and as part of the contractor's pre-construction planning. Some short-term, localized increase in sedimentation may occur during the culvert installation process. Visual monitoring will be conducted during the culvert construction period and if adverse water quality conditions are occurring, work will be stopped until the issues can be mitigated.

4.3.4.2 Operations

Accidental spills would be the only potential source of adverse surface quality in nearby watercourses throughout the operational period.

Use of fuels, lubricants and other potentially hazardous materials during the operations phase will be limited to those materials brought on site during the periodic maintenance activities. This would include fuels and other lubricants in maintenance vehicles and that are used to maintain the wind turbine generators. All maintenance vehicles will be equipped with a spill kit and a spill contingency and response plan will be in place for the duration of the operational period. Given this mitigation, and the limited quantity of material on site and the limited frequency and duration that it will be on site, no adverse effects due to accidental spills are anticipated to occur.

4.3.4.3 Residual Effects

No residual effects are anticipated with respect to impairments of surface water quality during construction or operation. Potential impacts resulting from construction or operations would be

temporary in nature and following effective use of mitigation measures and site restoration efforts, there will be no lasting adverse effects of surface water quality.

4.3.5 Groundwater

4.3.5.1 Construction

The possibility exists that excavations for foundation construction could require dewatering as a result of infiltration into the excavation, which could result in a decrease in the local availability of groundwater. Based on the shallow depth of required excavations, it is not anticipated that excavations shall encounter aquifers, and therefore any required dewatering will not impact the local availability of groundwater resources. Sediment control measures will be employed during any dewatering of excavations to prevent any impact on surrounding surface water bodies. Though any dewatering would be expected to involve minor amounts of water, if >50,000 L of water would be required to be taken per day from the excavation, a Permit to Take Water will be obtained from the Ontario Ministry of the Environment.

4.3.5.2 Construction/Operations

Groundwater quality could be impaired during construction and operations by contamination as a result of accidental spills. Mitigation measures identified in the Accidents and Malfunctions section with respect to spills (see Section 4.6) will be effective at minimizing potential impacts of accidental spills on groundwater quality.

Groundwater recharge could also be reduced during construction and operations as a result of an increase in the amount of impervious surfaces within the Project location. However, these surfaces will represent a small portion of the Project location and will be surrounded by relatively pervious lands, such as agricultural fields and natural vegetation communities, such that any impact on groundwater recharge is expected to be negligible.

4.3.5.3 Residual Effects

No residual effects are anticipated with respect to groundwater supply or quality. Potential impacts resulting from construction or operations would be temporary in nature and are expected to be negligible following effective use of mitigation measures and site restoration efforts.

4.3.6 Aquatic Habitats/Biota

Aquatic biota (e.g., fish and benthic invertebrates) and their habitat in the waterbodies on and adjacent to the Project location will not be directly affected by wind turbine, interconnection cabling, or distribution line installation activities, since none of these will occur within 30 m of the average annual high water mark of any watercourse.

However, the water crossing of the Peets Drain has the potential to have adverse effects on aquatic biota and habitat, as discussed in Sections 4.4.1 and 4.4.2. Indirect effects on aquatic biota and habitat due to changes in surface water runoff and quality could also occur, and these are discussed in Section 4.4.3.

4.3.6.1 Construction

Water Crossing Construction

In-water work will likely be required to facilitate the installation of the access road and culvert across Peets Drain. Depending on the amount of flow at the proposed crossing location, installation of the culvert may require dewatering of the proposed work area in order to minimize potential adverse effects on surface water quality and to ensure that the culvert is properly installed. If dewatering is required, this will likely involve installation of cofferdams upstream and downstream from the crossing location with watercourse flows being pumped, or otherwise diverted around the work areas. This will result in short-term blockage of fish movement at the crossing location (if fish are present during the construction period) and dewatering of existing aquatic habitat in the drain in the area between the cofferdams.

In order to mitigate the potential for adverse effects on aquatic biota in and downstream from the drain, water crossing installation will occur outside the warm water timing restriction specified by the MNR Aylmer District. Therefore, no in-water work will be conducted between March 15 and June 30 to protect the reproductive activities of the warm water fish community. Therefore, no adverse effects on critical reproductive activities will occur.

Prior to dewatering, fish, if present, will be removed from the area between the cofferdams (under authority of a License to Collect Fish for Scientific Purposes from the MNR) to prevent stranding. All fish will be transferred to the watercourse downstream from the work area. Some mortality of benthic invertebrates is anticipated to occur in the dewatered area. Dewatering and water diversion around the work will be conducted with a shrouded pump to prevent fish entrainment and mortality through the pump.

Therefore, water crossing construction will result in a short-term loss of habitat in the dewatered area, some disruption to aquatic biota due to in-water work (i.e., cofferdam installation) and some potential adverse effects on fish movement during the construction period. These effects will be mitigated to the extent possible by construction outside the reproductive period and limiting the duration and footprint of construction. Effects that do occur will be relatively minor in magnitude and short term in duration.

The footprint of the access road and culvert will have a minor long-term effect on aquatic habitat. However, given the low gradient, slow-moving nature of the Peets Drain, no adverse effects on fish movement are anticipated to occur at the culvert location. The culvert will be appropriately sized during the detailed design period to meet flow passage requirements, which will also provide appropriate velocities to facilitate fish movement. The culvert will be installed to ensure that it is not perched above the channel bed.

The footprint of the access road may result in some loss of aquatic habitat if the culvert or water crossing structure does not span the drain. The area proposed for the culverts consist of an excavated drain with some instream and riparian vegetation. The minor loss of habitat is not anticipated to have an overall effect on habitat productivity in this section of the drain.

A permit from the local municipality will be required to install the proposed culvert crossing. Any other terms or conditions of the permit will be complied with during installation of the culvert.

Installation of the Access Road to WTG 4

The access road to WTG 4 will run parallel to the Jenson Drain over a distance of approximately 200 m. The permanent road will be constructed within 30 m of the average annual high water mark of the drain (i.e., the drain top of bank). However, the road will be constructed within the existing agricultural field and will not disrupt existing riparian vegetation. Sediment and erosion control measures will be installed prior to installation of the access road to prevent erosion and sedimentation into the drain. This will include the installation of silt fences on the drain side of the access road.

Following construction of the access road, no agricultural activities will occur in the narrow (< 30 m wide) corridor between the road and the drain. It is anticipated that this area will be allowed to naturally revegetated, which may ultimately improve water quality and aquatic habitat in the drain by enhancing the width of the vegetated buffer.

Therefore, no long-term impacts on aquatic habitat in the drain are anticipated to occur due to construction of the permanent access road to WTG 4.

Indirect Effects

Aquatic biota and habitat in the Project location could potentially be indirectly affected if changes in surface water quality and groundwater quality or quantity were to occur as a result of any phase of the Project. However, the mitigation proposed in previous sections is anticipated to be effective in preventing/minimizing negative effects associated with these other biophysical components of the environment, such that there are no adverse effects on aquatic biota and habitat within the water bodies on and adjacent to the site during the construction period. Given this, no specific mitigation measures, other than those noted in the above-mentioned sections are required to prevent adverse effects to aquatic biota and habitat during construction.

4.3.6.2 Operations

No direct adverse effects to aquatic habitat or biota are anticipated to occur during the operations period. Indirect effects could occur due to changes in surface water quality associated with maintenance activities, although mitigation measures proposed to prevent/minimize the potential for accidental spills are anticipated to be effective. Therefore, no adverse effects on aquatic habitat and biota are anticipated to occur during operations.

4.3.6.3 Residual Effects

Overall, access road construction will result in a change in aquatic habitat due to the presence of the culvert across Peets Drain. There may be some short-term effects on aquatic habitat during the installation period. Mitigation measures specified will assist in minimizing the magnitude and duration of these effects. No long-term loss of aquatic habitat productivity is anticipated to occur as a result of road construction. No effects are anticipated to occur during operations.

4.3.7 Wetlands

As there are no wetlands within the Project location, no effects are anticipated as a result of the proposed development on any of these features.

4.3.8 Vegetation

4.3.8.1 Construction

Impacts to vegetation communities could result from construction of access roads, the distribution line, foundation construction, or any other activity that requires land, which would result in the removal of vegetation. As the majority of the Project features are to be placed on agricultural land, impacts to natural vegetation communities are to be restricted to minor losses associated with branch roads crossing roadside vegetation strips and placement of wooden poles. These losses are to be restricted to <1 ha in size and communities impacted consist predominantly of species tolerant of disturbances, in many cases including species that are exotic to the area, and are commonly found along roadways throughout the province. These losses will not result in impacts to the abundance or sustainability of these communities or individual species within the region. There will be no encroachment into the significant woodland.

Beyond the immediate loss of the individual plants in these locations, no impact to vegetation communities is anticipated. Some impairment of growth in plants could occur as a result of dust deposition on leaf surfaces, however mitigations measures with respect to impacts of fugitive dust deposition on air quality are expected to be effective at minimizing this potential (see Section 4.3.13).

Vegetation could also be damaged as a result of accidental spills/malfunctions. Mitigation measures identified in the Accidents and Malfunctions section with respect to spills (see Section 4.6) will be effective at minimizing potential impacts of accidental spills on vegetation.

There will be no impact to vegetation Species at Risk or the woodlands that have been identified from the study area.

4.3.8.2 Operation

There will be no impacts to vegetation communities, including the significant woodland, during the operations phase. The vast majority of the Project structures are located on agricultural lands and no clearing of vegetation would be required for any maintenance activity. Roadside vegetation communities within the study area are already maintained by the municipality; as a result no additional maintenance clearing for protection of the transmission line or other such features is required in these areas.

4.3.8.3 Residual Effects

Overall, a negligible loss of roadside vegetation will occur as a result of construction of branch roads. Therefore, there is no adverse residual effect with respect to vegetation or the woodlands as a result of construction or operation of the Project.

4.3.9 Birds

4.3.9.1 Construction

Impacts to birds during construction could occur as a result of disturbance from construction activities, loss of habitat, and incidental mortality from collisions with construction vehicles.

Birds breeding in close proximity to proposed work areas may be disturbed by construction activities. Species that are expected to be impacted would be those that nest within agricultural

fields or roadside vegetation communities, such as Horned Lark and Savannah Sparrow, which were regularly observed in these areas. In order to minimize potential impacts to breeding birds, major earth moving activities and any vegetation clearing will be conducted outside of the breeding bird period (generally May through July), wherever possible. If this is not possible, a trained avian biologist will inspect the proposed work area, plus an additional 100 m around the area, for nesting birds prior to any work being done to delineate workable areas (i.e., avoiding nests or other sensitive breeding habitat until area is abandoned for wildlife breeding). If an active nest of a species covered under the federal Migratory Birds Convention Act (MBCA) or the provincial Fish and Wildlife Conservation Act (FWCA) is located within a proposed work area, a mitigation plan (which may include the establishment of buffers around the active nests) will be developed to prevent impacts on migratory birds or their active nests, and submitted to EC (for MBCA species) or MNR (for FWCA species) for review prior to implementation.

Impacts to breeding wildlife will also be mitigated by the small footprint of the proposed facility within the landscape; there will remain abundant habitat similar to that which is disturbed in the surrounding lands. Further, wildlife found breeding on agricultural lands and within roadside vegetation communities are generally tolerant of human activity and could be expected to be somewhat tolerant of construction activities. As a result of these mitigation measures, and based on known characteristics of the bird community in the Project location, only minimal disturbance of migratory and non-migratory species is expected as a result of construction activities.

Construction of branch roads and turbine foundations will result in some loss of habitat for birds. However, the habitats lost are predominantly disturbed sites (such as roadside vegetation communities and agricultural fields), and these features are abundantly available in both the local and regional areas. Loss of habitat for breeding birds is expected to be negligible and is not anticipated to impact carrying capacity of the Project location for birds.

Incidental mortality of birds may occur from the movement of construction vehicles/equipment around the Project location. In order to minimize the potential for mortality of birds, speed limits along main roads will be obeyed, and speed limits will be placed along all branch roads constructed for the Project. Though it is not possible to fully prevent incidental wildlife mortality, the use of these mitigation measures will minimize the risk.

4.3.9.2 Operations

4.3.9.2.1 Turbine-Related Mortality and Disturbance Effects

Of primary concern during the operational phase of the Project is the potential for disturbance or mortality of bird populations from the wind turbines.

Though significant levels of bird mortality have been observed at older wind power facilities in the United States (such as the Altamont Pass Wind Resource Area in California; NWCC, 2004), aspects of modern wind farm design have mitigated many of these effects. Design aspects include

- consideration of bird use of the Project location is incorporated into the layout of facilities
- towers are tubular based, as lattice-based wind turbines may serve to attract birds, especially raptors, to perch on the structures, putting them at a greater risk of collision (Kingsley and Whittam, 2005)

- towers are free-standing, avoiding the use of guy wires which increases the risk of collisions.
- turbines use slow blade designs to prevent motion-smear that may make turbine blades difficult to see.

In addition, the following project specific mitigation measures are proposed to further minimize the potential for collision:

- turbines are to be < 150 m tall (to the maximum extent of the blade tip). Turbine heights greater than 150 m tall would present an increased risk to nocturnal migrant passerines that predominantly fly at heights greater than 150 m (Kingsley and Whittam, 2005).
- minimal strobe-lighting with infrequent flashes are to be used, within Transport Canada requirements, on the minimal number of WTGs permitted to prevent attraction of migrating passerines. Lighting on structures is considered to be one of the primary causes of mass mortality of birds at communication towers, however lighting on these structures is different than that employed on WTGs (i.e., use of steady burning lights). Though it is recommended that white flashing lights be employed on wind turbines, recent studies have found that the use of flashing red lights, as is currently required by Transport Canada, does not result in increased mortality (Curry and Kerlinger, 2007).
- turbines are to be spaced greater than 200 m apart in order to avoid inhibiting movement of avifauna (Kingsley and Whittam, 2005).
- turbines are to be placed at least 120 m away from woodlands and wetlands in order to minimize the potential for impacts to bird movement to and from these areas.

The results of studies conducted at modern wind power facilities in the US outside of California (where many older wind power facilities are located) indicate that an estimated 2.3 bird fatalities occur per turbine each year; though there can be extreme variability around this mark (range: 0.6 to 10 bird fatalities/turbine/year; NWCC, 2004). Based on this extreme variability, mortality monitoring results from wind power projects close to the study area (i.e., within southwestern Ontario) were gathered to provide a more accurate estimate of anticipated mortality for the Project:

- Erie Shores Wind Farm – a 99-MW (66 turbine) wind power facility located along the north shore of Lake Erie, to the east and west of Port Burwell, ON (~85 km east-northeast of the Project location). Mortality monitoring was conducted at this site during the spring and fall of 2006 and 2007 (results presented in James, 2008).
- Melancthon 1 Wind Plant – a 67.5-MW (45 turbine) wind power facility located in the southwest portion of Melancthon Township, ON (~220 km northeast of the Project location). Mortality monitoring was conducted over 12 weeks in the spring and fall of 2007 (results presented in Stantec Consulting Ltd., 2008).

The nearest operational facility to the Project is the 101.2-MW (44 wind turbines) Kruger Energy Port Alma (KEPA) Project, located in the municipality of Chatham-Kent along the north shore of Lake Erie in the vicinity of the town of Port Alma (~37 km southwest of the Project location). However, this project only became operational in October 2008 and mortality monitoring results are not yet available.

At the Erie Shores Wind Farm, the average estimated rate of bird mortality for the 2 years of study was determined to be around 2 to 2.5 birds/turbine/year (James, 2008), while results from Melancthon 1 recorded an estimated average of 1.4 birds/turbine/12 weeks of monitoring during spring/fall migration (Stantec Consulting Ltd., 2008). Results from year-round mortality monitoring at other facilities suggests that mortality levels are greatest during the spring and fall migration, when non-residents pass through the wind farm (Kingsley and Whittam, 2005). It is believed that breeding birds resident to the area of the facility become familiar with the turbines and are able to avoid them, while during the over-wintering period, the fewer number of birds found in the province at that time results in reduced mortality levels (Kingsley and Whittam, 2005). As a result, though the mortality estimates provided above for Erie Shores and Melancthon 1 are the result of surveys during spring and fall migration alone, it is expected that these levels would not significantly increase as a result of mortality during other seasons, and averages would remain around the average of 2.3 birds/turbine/ year for wind power facilities in North America (NWCC, 2004).

As the Project location is located away from a major migration corridor, baseline investigations failed to uncover evidence of significant bird use (see Section 3.3.3.2), and visibility during the spring and fall migration period is considered to be good (>1 km; see Section 3.4.1), it could be expected that mortality levels for this project may remain below this average. However, in order to provide a conservative measure, it will be assumed that mortality rates for the Project will approach the average of 2.3 birds/turbine/year. This estimated average is low when compared to other man-made structures such as roads (9 to 12 bird fatalities/km/yr) and communication towers (50 to 625 bird fatalities/tower/yr) (Kingsley and Whittam, 2005, Erickson et al, 2001).

Potential impacts of mortality on species guilds, including a discussion of disturbance impacts from operating wind turbines, are addressed below.

Landbirds

Landbirds were the most dominant species observed throughout the study area and stand to be most impacted by any proposed development. Landbird communities were consistent across seasons with what would be expected for the region. The most dominant species were those commonly associated with agricultural lands, predominantly Horned Larks and blackbirds (see Section 3.3.3.2).

Disturbance impacts are not expected to a significant degree with respect to landbirds in agricultural lands. As nesting within fields is already limited by the habitat structure, the placement of turbines within these areas is not expected to greatly reduce local breeding densities. Further, most passerines move predominantly at heights well below the blade sphere of most wind turbines (see Figure 4.3), and would therefore not be disturbed by their presence on the landscape. Observations at both Melancthon 1 (Stantec Consulting Ltd., 2008) and Erie Shores (James, 2008) observed little impact of the presence of wind turbines on landbird populations.

The greatest impact on landbirds will be collision impacts. Landbirds commonly represent more than 75% of all fatalities documented at wind turbine facilities (Kingsley and Whittam, 2005), and were ~90% of fatalities observed at Erie Shores (James, 2008).

Based on abundance within the site, and the occurrence of aerial flight displays during the mating seasons, it would be expected that Horned Larks would be most commonly found as fatalities. However, Horned Larks at Erie Shores appear to be tolerant of the presence of wind turbines and

have adapted movements to the structures, conducting aerial flight displays farther away from turbines when they are operating (James, 2008). In addition, only a single Horned Lark was observed as a fatality at Erie Shores (James, 2008), and none at Melancthon 1 (Stantec Consulting Ltd., 2008). Similar results would be expected at this site.

The species most commonly recorded as a fatality at Erie Shores were Golden-crowned Kinglets (*Regulus satrapa*; 6 in 2006 and 1 in 2007) and Red-eyed Vireo (*Vireo olivaceus*; 4 in 2006 and 7 in 2007). These species were observed within the Project location and may also be expected as fatalities here. However, the proximity (<10 km) of the Erie Shores wind power facility to Long Point, a well-known site where migrant landbirds congregate every spring and fall may result in higher numbers of these species being observed; in 2007, 500 Red-eyed Vireo and 750 Golden-crowned Kinglet were banded at Long Point during the spring and fall migration seasons (Mackenzie, 2008). Numbers of this magnitude were not observed within the Project location.

Though large flocks of blackbirds have been recorded in the fall at the Erie Shores wind farm, as was observed within the Project location (though in many cases at least an order of magnitude larger at Erie Shores), none were recorded as fatalities over the 2 years of mortality monitoring (James, 2008). Based on observations from the study area, blackbirds appear to be able to recognize and avoid operating turbines, with several flocks observed moving among turbines associated with the wind farm (James, 2008).

Overall, landbirds are expected to form the dominant component of fatalities associated with the Project, however these effects, and any negligible disturbance impacts, are not expected to significantly influence local populations or use of the Project location.

Potential impacts to PIF Priority Landbird Species, and landbird species at risk, are discussed separately below.

Owls

Limited use of the study area by owls was documented during baseline investigations, with only two Eastern Screech-owls recorded (see Section 3.3.3.2.1). Though a limited number of owls were recorded, use of the study area by owls is expected to occur across all seasons, with non-resident populations during the migration and over-wintering periods variable by year depending on prey populations.

There is very little information available on the potential impacts of WTGs on populations of owls. Overall, owls are not expected to be at significant risk of collision with WTGs as behaviour of these species does not bring them into close proximity with the proposed blade sphere. Most species of owl remain below blade height, foraging from a perch or coursing low over the ground, and disturbance impacts on these species are expected to be limited. No owls have been recorded as fatalities at either Erie Shores (James, 2008) or Melancthon 1 (Stantec Consulting Ltd., 2008) wind power facilities.

Raptors

The most commonly observed raptor within the study area was the Turkey Vulture, with Red-tailed Hawk and Northern Harrier observed across all seasons. Raptor use of the study area was consistent across all seasons with what would be expected for southern Ontario agricultural lands. Some

migrant raptors were recorded throughout the study area during the spring and fall migration periods, however numbers were not significant and represented movements across a broad front. Though significant numbers of raptors move westward along the shoreline of Lake Erie during fall migration, the study area is sufficiently setback from the shoreline (> 5 km), such that it is well outside of the migration corridor and there should be no impact on this movement.

Raptors observed at Erie Shores appeared either undeterred by (such as Red-tailed Hawks) or able to easily recognize and avoid (such as Turkey Vultures) wind turbines (James, 2008). As a result, relatively minor disturbance effects would be expected to be observed at this smaller facility, where only 5 to 6 turbines are to be deployed in a relatively small area.

Though raptors have been recorded as significant contributors to bird mortality at some wind power project (such as Altamont in California and Tarifa in Spain); however these sites are considered to be special cases:

- Altamont contains several thousand, older-generation turbines in an area recognized as an important raptor wintering area.
- Tarifa is located on the edge of the Strait of Gibraltar and is considered to be a bottleneck concentrating migrant raptors as the move through the Mediterranean basin. During the autumn migration, 30 000 raptors pass through this area.

Raptors are not commonly recorded as fatalities at modern wind power facilities, representing only 2.7% of those birds recorded as fatalities (Kingsley and Whittam, 2005). Two raptors were recorded as fatalities during both years of post-construction monitoring at Erie Shores (James, 2008), while two raptors were recorded as fatalities during the single year of monitoring at Melancthon 1 (Stantec Consulting Ltd., 2008). As these facilities are comprised of 45 to 66 turbines installed over a much larger area, it would be expected that a correspondingly lower number of raptors would be observed as fatalities at this site.

Bald Eagle, Golden Eagle, Northern Harrier, and American Kestrel are discussed individually below.

Shorebirds

Three species of shorebirds were recorded within the study area during baseline investigations; Killdeer, Upland Sandpiper (*Bartramia longicauda*), and Spotted Sandpiper (*Actitis macularius*). Killdeer, a commonly observed shorebird in Ontario, were by far the most numerous shorebird around the study area and observed regularly moving across the agricultural lands during the spring through fall periods. During the summer breeding period, an Upland Sandpiper was recorded in the extreme southeast of the study area, while two Spotted Sandpipers were noted at the reclaimed wetland in the northeast of the study area. The absence of prime shorebird habitat within the study area suggests that there should be no disturbance impacts on shorebird species and potential mortality should be minimal, which has been observed for most wind farms in North America (Kingsley and Whittam, 2005). No shorebirds were recorded as fatalities at either the Erie Shores (James, 2008) or Melancthon 1 (Stantec Consulting Ltd., 2008) wind power facilities. In addition, results from behavioural monitoring at Erie Shores found that Killdeers largely ignored the presence of the turbines, and were regularly observed foraging and flying in close proximity to them (James, 2008).

In addition, impacts to migrant shorebirds passing through the Project location should also be low. Though the area around Rondeau Provincial Park is considered to be important for migrant shorebirds; none outside of Killdeers were observed during baseline Spring monitoring. Similarly low numbers of shorebirds were observed during migration monitoring at the proposed Talbot Wind Farm, located immediately south of the study area along the shoreline of Lake Erie (Dillon Consulting Ltd., 2008). The absence of observations in either of these surveys suggest that the area immediately east of Rondeau is not an important component of the shorebird migration route, and no significant impact on migrating shorebirds would be expected from the proposed development.

Waterbirds

As with shorebirds and owls, few species of waterbirds were observed within the study area over the year of baseline monitoring. The predominant waterbird species was Ring-billed Gulls, with only one or two observations of American Bittern (*Botaurus lentiginosus*), Great Blue Heron (*Ardea herodius*), and Common Tern noted during baseline investigations. The absence of habitat suitable for most species of waterbirds (i.e., wetlands, other waterbodies) limits their occurrence within the area (see Section 3.3.3.2.1).

As a result, the low numbers of these species occurring within the Project location, outside of gulls, is expected to result in limited impacts. As there are no waterbirds breeding within the area, there should be no loss of breeding habitat, and any waterfowl crossing the Project location are expected to be capable of manoeuvring around operational turbines (as was observed in Great Blue Herons at Erie Shores; James, 2008). Very few fatalities of waterbirds have been reported at wind power projects (Kingsley and Whittam, 2005), and a single Virginia Rail (*Rallus limicola*) was the only waterbird (excluding gulls) that was recorded as a fatality at Erie Shores (James, 2008), while no waterbirds were found as a fatality at Melancthon 1 (Stantec Consulting Ltd., 2008).

With respect to gulls, large flocks were observed in both the spring and fall periods, numbering anywhere from 5 to 35 birds (see Sections 3.3.3.2.2 and 3.3.3.2.3). The presence of the wind turbines in the Project location may influence the movement of gulls through the site, as they may avoid the operating turbines, flying around the Project location. At the Erie Shores Wind Farm, gulls were recorded moving predominantly well above the turbines, and few were recorded closer than 200 m from an operating turbine (James, 2008). Similar patterns of movement can be expected around this Project. Given the large area across which gulls are currently moving, this is not expected to impact local populations. Gulls were not commonly observed on the fields of the Project location, and this is not expected to significantly change following construction. Though gulls regularly fly through the Project location in the risk zone, very low numbers have been reported as fatalities at wind power projects (Kingsley and Whittam, 2005). Similarly, only a single gull (of the hundreds that may pass the site on a daily basis) was reported as a fatality during baseline monitoring at the Erie Shores Wind Farm (James, 2008) and none were observed during baseline monitoring at the Melancthon 1 Wind Plant (Stantec Consulting Ltd., 2008). As a result, low levels of gull mortality are expected.

Waterfowl

Waterfowl (ducks, geese, and swans) are not commonly observed as victims of collision with WTGs to any significant extent (Kingsley and Whittam, 2005). Similarly, no waterfowl were observed as fatalities at either the Erie Shores (James, 2008) or Melanchthon 1 (Stantec Consulting Ltd., 2008)

wind power facilities. As a result, waterfowl are not expected to be recorded as fatalities associated with the Project.

The greatest potential impact on waterfowl is disturbance. Waterfowl populations during the breeding season are limited given the absence of suitable habitats within the study are. The greatest levels of waterfowl use were recorded during the spring migration period, when migrating Tundra Swans, Common Loon, and Wood Duck were observed within the study area (see Section 3.3.3.2.2). Observations at other sites have found that waterfowl exhibit avoidance behaviour from operating wind turbines (Kingsley and Whittam, 2005), and so it would be expected that waterfowl movements in the immediate Project location may be reduced during spring migration. Observations at Erie Shores found that Canada Geese, Tundra Swan, and other species of waterfowl were little affected by the presence of the turbines (James, 2008). There is an abundance of suitable foraging habitat found within the local area of the Erie Shores wind farm, and all species of waterfowl were capable of flying through or over the wind farm (James, 2008). Canada Goose, the most commonly observed species, were regularly noted less than 200 m away from wind turbines while on the ground, and several thousand were recorded passing within 100 m of operating turbines while in the air (James, 2008). Similar results would be expected for this Project, with no impacts to waterfowl use of, and movement through, the regional area, or sustainability of migrating populations.

Species of Conservation Concern/Species at Risk

Effects of potential collisions between WTGs and PIF priority species are as follows:

- **Northern Harrier** – Northern Harriers were recorded within the Project location across all seasons. Northern Harriers were commonly observed within the Project location foraging low over the agricultural fields. Northern Harriers do nest within pastures and hayfields, so there may be some avoidance of turbines in relation to nest placement; however, harriers at Erie Shores appeared relatively unconcerned by the turbines (James, 2008). Occasional mortality of Northern Harrier have been reported from wind power facilities in the United States (Kingsley and Whittam, 2005), though none are known to have been killed at facilities in Ontario. Overall, it is possible that a Northern Harrier fatality may occur over the life time of the Project; however this possibility is considered remote.

- **American Kestrel (*Falco sparverius*)** – American Kestrels were commonly recorded across the site during the fall migration period (see Section 3.3.3.2.3). They were predominantly observed foraging over the agricultural fields. Kestrels are fairly tolerant of human activity and would not be expected to be greatly disturbed by the presence of operating turbines. Foraging kestrels would commonly be found below the risk zone, and observations from Erie Shores noted that migrant or resident kestrels were not intimidated from moving through the wind farm and were considered to be not at great risk of collisions (James, 2008). No American Kestrels have been found as fatalities in Ontario, though several have been reported as fatalities on their wintering grounds in the United States (Kingsley and Whittam, 2005). It is possible that an American Kestrel fatality may occur over the lifetime of the Project; however once more this possibility is considered to be remote given no observed fatalities in the province and known behaviour around operating turbines.

- **Black-billed Cuckoo (*Coccyzus erythropthalmus*)** – Black-billed Cuckoos were recorded in two separate locations, on the edge of a woodlot in the southern extreme of the study area, and in a

shrubby creekbed (see Section 3.3.3.2). Previously identified mitigation, whereby turbines will be placed at least 120 m away from any woodland should minimize potential disturbance impacts on this species. Turbines are also to be placed in agricultural lands, which are not preferred habitats of cuckoos. Mortality of Black-billed Cuckoos as a result of the turbines is not expected; their movements are expected to occur below the risk zone, and none have been recorded as fatalities at wind power facilities in Ontario. Two Black-billed Cuckoos have been recorded as fatalities at a wind power facility in West Virginia, however this facility is located in forested habitats, which may attract cuckoos, as opposed to the agricultural fields in which these turbines were placed (Kingsley and Whittam, 2005).

- **Belted Kingfisher (*Ceryle alcyon*)** – Belted Kingfishers were observed within the study area around Fleming Creek. Kingfishers would be expected to occur in close proximity to waterways of the Project location, and would be observed moving predominantly below the heights of the turbines. As turbines are not to be placed near these features, there should be no impact on kingfishers. No Belted Kingfishers are known to have been reported as fatalities at wind power facilities (Kingsley and Whittam, 2005).

- **Northern Flicker (*Colaptes auratus*)** – Northern Flickers were recorded within the woodlots of the study area. Previously identified mitigation, whereby turbines will be placed at least 120 m away from any woodland should prevent potential disturbance impacts on this species. Observations from the Erie Shores Wind Farm observed no impact of turbines on Northern Flickers (James, 2008), and none are anticipated from this Project. Mortality of Northern Flicker as a result of the turbines is not expected; their movements are expected to predominantly occur below the risk zone, and very few have been recorded as fatalities at wind power facilities in the United States (Kingsley and Whittam, 2005).

- **Eastern Wood-pewee (*Contopus virens*)** – Eastern Wood-pewees were a commonly recorded species within the woodlots of the study area (see Section 3.3.3.2.1). As with flickers, placement of turbines away from woodlots should prevent potential disturbance impacts on pewees. Mortality of Eastern Wood-pewees is also not expected; none are known to have been recorded as fatalities at wind power facilities in North America (Kingsley and Whittam, 2005).

- **Willow Flycatcher (*Empidonax traillii*)** – Willow Flycatchers were recorded within shrubby areas of the study area. As turbines are to be placed in agricultural fields, it is not expected that there will be significant disturbance impacts on willow flycatchers. Movements of willow flycatchers are expected to be below the risk zone, and therefore mortality is not expected. No willow flycatchers are known to have been recorded as fatalities at wind power facilities in North America (Kingsley and Whittam, 2005).

- **Eastern Kingbird (*Tyrannus tyrannus*)** – Eastern Kingbirds were observed along the northern extreme of the study area, near Woodlot 3 and the small recovered wetland. No turbines are to be placed in these locations, and therefore disturbance effects and mortality are not anticipated for kingbirds. An Eastern Kingbird at Erie Shores was observed flying low below the risk zone picking insects off of the support tower itself (James, 2008); therefore they do not appear to be impacted by the presence of the turbines. No kingbirds have been known to be recorded as fatalities in Ontario, while one kingbird was noted as a fatality at a wind power facility in

Wisconsin (Kingsley and Whittam, 2005). Therefore, kingbirds are not expected to be recorded as fatalities.

- **Bank Swallow (*Riparia riparia*)** – A few Bank Swallows were observed during each of the spring, summer, and fall seasons, predominantly observed foraging low over the fields. Suitable nesting habitat is limited within the study area, and observed individuals are expected to nest outside of the study area. Movements of Bank Swallows should be below the risk zone; at Erie Shores, less than 1% were noted as high as the risk zone (James, 2008). Several hundred bank swallows were observed foraging in close proximity to operating turbines at Erie Shores, and therefore no disturbance effects are anticipated (James, 2008). The limited use of the study area, combined with known behaviour patters of Bank Swallows, is expected to result in no mortality. Though three Bank Swallows were recorded as fatalities at Erie Shores (James, 2008), the heavy level of use at the site resulting from close proximity to a known colony at the shore bluffs (containing hundreds of nesting bank swallows) is expected to be the cause of this occurrence. This is the only known record of bank swallow fatality at a wind power facility for North America (Kingsley and Whittam, 2005).

- **Wood Thrush (*Hylocichla mustelina*)** – Wood Thrushes were commonly recorded within the woodlots of the study area (see Section 3.3.3.2.1). As with flickers, placement of turbines away from woodlands should prevent potential disturbance impacts on wood thrushes. Mortality of Wood Thrush is also not expected given placement of the turbines in agricultural fields; none have been recorded as fatalities at wind power facilities in Ontario. Three were noted as fatalities at a facility in West Virginia (Kingsley and Whittam, 2005), however, this facility is located in forested habitats which would be expected to contain Wood Thrush.

- **Blue-winged Warbler (*Vermivora pinus*)/Golden-winged Warbler (*Vermivora chrysoptera*)** – Blue-winged and Golden-winged Warblers are considered together given the similarity between these species and their well-known tendency to hybridize. Though noted as possible breeders within OBBA squares that overlap the study area (Vallender, 2007a,b), none were observed within the study area. Given the distinctive calls of these species, were they present it is believed that they would have been detected. Therefore, neither of these species is expected to occur within the Project location. There are no known records of Blue-winged or Golden-winged Warbler fatalities within North America (Kingsley and Whittam, 2005). As a result, no disturbance or mortality effects are anticipated.

- **Prairie Warbler (*Dendroica discolor*)** – No Prairie Warbler were recorded breeding within Region 2 during the 2001 to 2005 Ontario Breeding Bird atlas (Harris, 2007), though an individual was noted during surveys within the Project location and an Prairie Warbler was recorded from the first breeding bird atlas around the Skunk's Misery IBA, located north of the study area. Given this, and that fact that the warbler observed within the site was not heard again, the Prairie Warbler observed is determined to be a transitory individual and not a local resident breeder. Therefore, no impacts are expected on Prairie Warbler. There are no known records of Prairie Warbler mortality at wind power facilities in North America (Kingsley and Whittam, 2005).

- **Rose-breasted Grosbeak (*Pheucticus ludovicianus*)** – Rose-breasted Grosbeaks were observed within the woodlots of the study area during both the breeding and spring migration season. A

small flock of migrating grosbeaks was observed within the southern-most woodlot during the late spring. As with Wood Thrush, placement of turbines away from woodlots should prevent potential disturbance impacts on grosbeaks. Mortality of Rose-breasted Grosbeaks is also not expected given placement of the turbines in agricultural fields; a single Rose-breasted Grosbeak was recorded as a fatality at Erie Shores (James, 2008), while three were noted as fatalities at a facility in West Virginia (Kingsley and Whittam, 2005); however, the facility in West Virginia is located in forested habitats which would be expected to contain grosbeaks, and some turbines at Erie Shores are located less than 50 m from woodlots. Therefore, the use of the setback from trees associated with this Project is expected to be effective at minimizing potential fatalities of grosbeaks.

- **Eastern Towhee (*Pipilo erythrophthalmus*)** – No Eastern Towhees were detected during the baseline investigations, though they were confirmed as breeding within the OBBA square which overlaps the study area. Given that Eastern Towhee can be easily missed during surveys as they give songs during short bouts, it is considered likely that this species occurs and was simply missed. Eastern Towhee are a habitat generalist and can be found in a wide range of natural habitats (Timpf, 2007). Eastern Towhee were noted within 100 m of wind turbines at Erie Shores (James, 2008), and therefore disturbance impacts are not expected to be a concern. No Eastern Towhees are known to have been recorded as fatalities within North America (Kingsley and Whittam, 2005). Movements of towhees should be predominantly below the risk zone and therefore no fatalities of Eastern Towhee are expected.

- **Field Sparrow (*Spizella pusilia*)** – Field Sparrow were uncommon within the study area, though suitable habitat is found along woodland edges and roadsides. Field Sparrows are not expected to be disturbed by operating turbines; they were recorded within 100 m of operating turbines at Erie Shores (James, 2008). Activities of Field Sparrow remain predominantly below the risk zone, and therefore mortality is not anticipated to be an issue; no Field Sparrows are known to have been recorded as fatalities at any wind power facility in North America (Kingsley and Whittam, 2005).

- **Vesper Sparrow (*Pooecetes gramineus*)** – As with Field Sparrows, Vesper Sparrows were uncommon within the study area, and suitable habitat (dry, short-grass; Rising, 2007) is limited. Vesper Sparrow at Erie Shores were observed nesting 30 m from the base of an active turbine, therefore they do not appear to be disturbed by the presence of operating turbines (James, 2008). There is concern that Vesper Sparrows may be observed as fatalities due to the occasional tendency to perform flight songs during the breeding season that may bring them within the risk zone (Well and Vickery, 1994); and Vesper Sparrows have been recorded as fatalities at wind power facilities in the United States (Kingsley and Whittam, 2005). However, turbines are to be placed in agricultural fields which does not provide suitable breeding habitat for Vesper Sparrows; therefore fatalities are not expected.

- **Savannah Sparrow (*Passerculus sandwichensis*)** – Savannah Sparrows were consistently observed throughout the study area from spring through fall. At the Erie Shores Wind Farm, Savannah Sparrows were observed nesting within 20 m of operational turbines; therefore there does not appear to be a disturbance effect. Though they are regularly found in habitats where turbines are located, fatalities of savannah sparrows are uncommon (Kingsley and Whittam,

2005), and none have been reported for Ontario wind farms. Movements of Savannah Sparrows occur predominantly below blade heights, minimizing the risk of potential collision; therefore, though it is possible, given their abundance in the study area, that Savannah Sparrows may be recorded as fatalities, this potential is considered low.

- **Eastern Meadowlark (*Sturnella magna*)** – Eastern Meadowlarks were uncommon during baseline investigations, with only a single calling individual recorded. Eastern Meadowlarks at Erie Shores showed no aversion to approaching operating turbines, and therefore the potential for disturbance effects is considered low. There are no known fatalities of Eastern Meadowlarks at wind power facilities in North America (Kingsley and Whittam, 2005). Movements of Eastern Meadowlark are expected to occur predominantly below the risk zone; the possibility of Eastern Meadowlark fatality is considered low.
- **Baltimore Oriole (*Icterus galbulla*)** – Baltimore Orioles were recorded across woodlots of the study area from spring through fall. As with Wood Thrush, placement of turbines away from woodlots should prevent potential disturbance impacts on orioles. Further, mortality of Baltimore Orioles is also not expected given placement of the turbines in agricultural fields and the absence of any known oriole fatalities at wind power facilities in North America (Kingsley and Whittam, 2005).

Effects of potential collisions between WTGs and avifaunal Species at Risk are as follows:

- **Bald Eagles** – Though no Bald Eagles were observed within the Project location, a nest is known to occur approximately 2 km south of the study area. Use of the Project location by Bald Eagles is expected to be remote given the absence of suitable foraging habitat. Therefore, given the distance between the proposed Project and the nest, and the absence of use of the Project location, impacts to Bald Eagles are expected to be non-existent. To date, no bald eagles are known to have been recorded as victims of collisions with WTGs (Kingley and Whittam, 2005).
- **Golden Eagles** – Golden Eagle use of the study area is expected to be limited. Though a single eagle was observed during over-wintering monitoring, no others were observed during any other survey. Golden Eagles have been commonly recorded as victims of collision with WTGs on their wintering grounds in California (Kingsley and Whittam, 2005), however this may be the result of an absence of suitable perch locations on the wintering grounds promoting perch attempts on lattice-towered WTGs (Kochert et al., 2002), or while hunting for prey in and around wind turbines on the wintering grounds. Though it is possible that a Golden Eagle crossing the Project location may be at risk of colliding with a turbine, observations from Erie Shores found that Golden Eagles were able to successfully pass operating turbines (James, 2008) and none were recorded as fatalities at the site. Given the overall absence of use within the Project location, no impacts on Golden Eagles are expected.
- **Common Nighthawk** – Common Nighthawks are not expected to be currently breeding within the Project location, with occasional passing of birds during migration expected. It would be expected that Common Nighthawks would be capable of observing and avoiding turbines while in flight. No Common Nighthawks have been recorded as fatalities of wind turbines within Ontario, though a single Common Nighthawks was reported as a fatality at a site in Wyoming (Kingsley and Whittam, 2005). Similarly, Common Nighthawks do not appear susceptible to

collisions with stationary objects (Poulin et al, 1996). Overall, the absence of regular occurrence within the site throughout the year suggests that there should be no impact on these species.

- **Chimney Swift** – Observations of Chimney Swift were restricted to the town of Highgate. Based on the absence of observations from the Project location, no disturbance or fatality effects are expected for swifts. Chimney Swifts are not commonly recorded as fatalities (Kingsley and Whittam, 2005), though one was recorded as a fatality at the Prince Wind Power Project, near Sault Ste. Marie (ON), in each of 2007 and 2008 (NRSI, 2009).
- **Red-headed Woodpecker** – Though none were observed during baseline investigations, the abundance of suitable habitat within the study area suggests that Red-headed Woodpeckers are present. Previously identified mitigation, whereby turbines will be placed at least 120 m away from suitable habitat should minimize potential disturbance impacts on this species. Further, Red-headed Woodpeckers occurring in proximity to the Erie Shores Wind Farm showed no avoidance of operating turbines (James, 2008). Mortality of Red-headed Woodpeckers as a result of the turbines is not expected; their movements are expected to occur predominantly below the risk zone, and none are known to have been recorded as fatalities at wind power facilities (Kingsley and Whittam, 2005; James, 2008).
- **Canada Warbler** – Canada Warblers were not recorded within the study area during baseline investigations, though suitable habitat was observed . As this species is a forest breeder, previously proposed setbacks from woodlands are expected to be effective at preventing either disturbance effects or fatalities in this species. As with Chimney Swifts, Canada Warblers are not commonly recorded as fatalities (Kingsley and Whittam, 2005), but one was recorded at the Prince Wind Power Project in each of 2007 and 2008 (NRSI, 2009). However, the Prince Wind Power Project occurs within a forested landscape that would provide ample habitat for Canada Warbler. As a result, at this site, where habitat is limited and setbacks from wooded sites have been imposed, no fatalities of Canada Warbler are expected.
- **Yellow-breasted Chat** – Yellow-breasted Chats are considered as a possible, though undetected, breeder within the study area. Previously proposed setbacks from wooded areas are also expected to be effective at minimizing potential impacts to Yellow-breasted Chat. Based on available information to date, no Yellow-breasted Chats are known to have been recorded as fatalities at wind power facilities (Kingsley and Whittam, 2005; James, 2008; NRSI, 2009).
- **Bobolink (*Dolichonyx oryzivorus*)** – Bobolinks were recorded near a roadside grassland site in the northwestern portion of the study area, though this area was located >120 m from any portion of the Project. Bobolink at Erie Shores were observed within 100 m of wind farms (James, 2008), and would be considered tolerant of human disturbances; therefore no disturbance effect is anticipated on Bobolink. No Bobolinks are known to have been recorded as fatalities within North America, and there will be no turbines placed near the Bobolink location within the study area. As a result, no Bobolink fatalities are expected.

Based on the above, no residual effects for Species at Risk or Species of Conservation Concern are anticipated during operations of this Project.

4.3.9.2.2 Other effects

Bird fatalities could also occur as a result of collisions with above ground cabling. In order to minimize the potential for collisions, interconnection cabling between turbines and the substation is to be placed underground where practical. Overhead cabling for the interconnecting line from the substation to the distribution network is to be constructed such that conductors and structures are spaced with consideration for reducing potential collisions. Further, bird flappers or diverters are to be installed in locations along any portion of cabling which runs above ground (NWCC, 2007). Some collisions may still occur between birds and above ground cabling associated with the Project, however the use of the mitigations measures should lower the levels of this mortality.

Disturbance of birds as a result of maintenance activities would be expected to be minimal. Wherever possible, maintenance workers are to be restricted to previously disturbed lands. Further, the anticipated infrequent nature of site visits should result in limited disturbance to these birds. Some species sensitive to the presence of workers within their habitat may move away from the work area, however maintenance activities should be short term in nature and these species would be expected to return following the completion of work.

4.3.9.3 Residual Effects

During construction, residual effects with respect to birds will occur as a result of low levels of disturbance from construction activities, minor loss of habitat, and some incidental mortality from the movement of construction vehicles/machinery across the Project location. Overall, impacts during construction are not anticipated to result in changes in local abundance of bird populations or alteration of the carrying capacity of the local habitat.

During operations, birds will be impacted by mortality caused by collisions with aboveground cabling or disturbance/mortality from the wind turbines. Following effective use of mitigation measures, collisions with above ground cabling are not anticipated to result in levels of bird mortality that would affect local populations.

Based on mortality monitoring from other locations, mortality estimates can be anticipated on the order of 2 to 3 birds/turbine/year, with the majority being comprised of landbird species. It is possible that some avian species of conservation concern may be killed during the operational life of the Project, however this would be expected to be uncommon. It is not expected that any Species at Risk will be killed during the life of the Project.

Some disturbance from the Project location may occur as a result of the operating turbines, particularly in waterfowl, such as Tundra Swans. Breeding species would be expected to adapt to the presence of the turbines in the local environment, while migratory species would be expected to fly around the facilities. Given the relatively small size of the Project, this is not expected to seriously affect migratory populations.

4.3.10 Bats

4.3.10.1 Construction

During construction, impacts to bat populations could potentially occur from loss of habitat or disturbances. As it is not anticipated that any trees will be cleared for the Project, there is no potential for loss of bat habitat. Further, as construction will occur during the daytime, and since

most construction activities will occur in agricultural fields, the potential for disruption of active, breeding, or roosting bats is considered to be minimal. Therefore, there is no effect of construction on local or migratory bat populations.

4.3.10.2 Operations

4.3.10.2.1 Bat Mortality

Compared with birds, concern with respect to potential impacts of wind power facilities on bat populations developed relatively recently when significant mortality levels were recorded at some modern wind power facilities in forested landscapes of the Eastern United States (Arnett et al., 2005). For example, as many as 2000 bats are estimated to have been killed during a 6-wk period in 2004 at a 44 turbine facility in West Virginia (Arnett et al., 2005). Compared with birds, relatively little is known about bat populations in Ontario, how bats interact with wind turbines, and what reported levels of mortality mean for bats (MNR, 2006).

Thus far, extreme levels of bat mortality, such as those that are discussed above, appear to be restricted to forested habitats; the estimates for agricultural/grassland landscapes range 0.1 to 7.7 bat fatalities/turbine/year, compared to the estimates of 20.8 to 47.5 bats/turbine/year in forested areas. As the proposed facility is to be located in an agricultural setting, extreme levels of bat mortality should not be expected (MNR, 2006). Results from Erie Shores recorded an estimated 4.5 to 5.5 bats/turbine/year; however some turbines at this location are located about 200 m or less from Lake Erie shore bluffs and are lit with steady red lights, factors which were found to result in elevated levels of mortality (James, 2008). There was also some limited evidence that proximity to trees (blades $<$ 50 m away) had some influence on bat mortality (James, 2008). Similar mortality levels were reported for the Melancthon 1 wind plant, with an estimated 4.4 bat fatalities per turbine; results from this facility were inconclusive for contributing factors, as a result of the low number of fatalities recorded during the single year of observations, however again turbines proximal to large woodlands ($<$ 50 m away) recorded the highest fatality rate (Stantec Consulting Ltd., 2008). Based on these factors, it could be estimated that turbine mortality associated with the Project may occur at lower levels than those reported above given that

- turbines are to be placed at least 120 m away from any woodland
- turbines are to be placed a minimum of 6 km from the shoreline
- minimal strobe-lighting with infrequent flashes, as opposed to steady lighting, is to be used, within Transport Canada requirements.

Unlike birds, bat mortality at wind turbines can occur either as a result of direct collision, or from barotrauma. Barotrauma, which involves tissue damage to lungs caused by a rapid or excessive pressure change, can occur when bats enter the zone of low pressure created around the moving turbine blades. The drop in pressure causes the air inside the lungs to expand, damaging the surrounding tissue; the physiology of bird lungs are believed to be capable of withstanding such pressure changes. Barotrauma has been theorized to account for at least 50% of bat mortality at wind power projects (Baerwald et al., 2008).

However, regardless of the cause, the fatalities themselves are the primary concern. Several theories have been proposed to explain why bat fatalities may be occurring (see MNR, 2006); however, of these, those that directly relate to events of mass mortality in bats can be discounted for this project:

- that bats are attracted to lit areas such as wind farms because of higher insect activity. Given that the Project will be placed in southern Ontario near several small towns which will provide large lit areas, compared to the strobe-lighting to be found on turbines, the lights associated with the proposed development are not expected to result in elevated levels of insect activity.
- that wind farms tend to be built in areas where insects are concentrated (e.g., hilltops and ridges), thus in prime foraging habitat for bats. The Project location is not associated with these features.
- that open spaces around turbines create favourable foraging habitats. The Project location is located within agricultural lands; no new open spaces will be created.
- that corridors created for wind turbine construction may be convenient flight pathways for migrating bats, which 'funnel' bats to the wind farm. No corridors will be created in association with this project and no 'funnelling' effect is anticipated.

Monitoring at wind power facilities across North America have found that periods of bat mortality are predominantly restricted to the late summer/early fall swarming and migration periods; generally from mid-July through September (MNR, 2006). As with birds, resident bats appear to adapt to the presence of the wind turbines within the landscape and are not as susceptible to collisions.

As discussed in Section 3.3.3.3.1, acoustic monitoring conducted during the month of August and into early September recorded low levels of bat activity at stations located away from arboreal vegetation. No turbines will be placed within wooded areas, and turbines will not overtop treed areas. Beyond these sites, there was no evidence of bat activity at levels beyond those that would be anticipated for the region, and given that construction of the Project will not result in a significant alteration to the local environment, the Project is not anticipated to result in extreme levels of bat mortality. The site does not appear to be located along a major migratory flyway, which would be of greatest concern for bats and is linked to the elevated numbers observed at other sites. Further, though not directly searched for, there are no known bat hibernacula or caves within the study area.

Mortality monitoring will be conducted during the first year of operations of the Project to calculate an estimated mortality (see Section 6). If mortality monitoring observes significantly higher levels than expected, additional mitigation measures, such as temporary shutdown of select turbines will be considered, justified, and agreed upon in discussion with MNR. The use of bat deterrents, such as ultrasound emissions, at WTGs is currently under investigation by researchers at various wind power facilities, however the efficacy of such units is currently unclear (Horn et al., 2008b; Szewczak and Arnett, 2008). Should additional progress be made in this regard, the use of such deterrents will also be considered.

Species Composition

Results from post-construction monitoring conducted to date appears to indicate that bats which migrate over long distances to wintering sites appear to be more susceptible to collisions with operating wind turbines, with three species (Hoary Bats, Red Bats, Silver-haired Bats) making up

>80% of wind power related mortalities (MNR, 2006). It is unclear why these species form the largest mortality component in some areas; however it has been suggested that Hoary Bats might not echolocate during migration (MNR, 2006).

All three species of long-distance migrants were recorded during baseline acoustic monitoring within the study area, with Silver-haired Bats (in combination with Big Brown Bats as these species cannot be distinguished based on call alone) being the most common. Distribution among the remaining six species was relatively even. As a result, it could be expected that long-distance migrants would form the primary component of mortality at this site. Results from mortality monitoring in 2006 and 2007 at the Erie Shores wind farm found that long-distance migrants comprised nearly half of the fatalities found; however the single species that was most greatly affected was the Big Brown Bat, which individually accounted for approximately 37% of all recorded fatalities (James, 2008). Given that that combined group of Big Brown Bats and Silver-haired Bats was the most commonly recorded within the Project location, it can be expected that Big Brown Bats would also form a primary component of post-construction mortality.

As discussed above, significant mortality levels are not anticipated in association with the Project. As a result, impacts on bat populations are not expected to result in significant effects on populations of the short-distance migrant Big Brown Bat, which are anticipated to form the primary component of post-construction mortality, or long-distance migrants, which are known to be susceptible to collisions with turbines.

Impacts to bat species of conservation concern (Eastern Pipistrelle, Small-footed Bats, and Northern Long-eared Bats) are not expected as these species were not abundant within the Project location during baseline acoustic monitoring, and none of these species are considered to be long-distance migrants. Further, no Eastern Pipistrelle, while only six Northern Long-eared Bats (as well as 13 *Myotis* bats, which includes both Northern Long-eared and Small-footed Bats), were recorded as fatalities at Erie Shores (James, 2008). Therefore considerable mortality levels in species of conservation concern are not anticipated.

4.3.10.2.2 Other Impacts

Bats could also potentially be disturbed by the presence of the turbines in the environment. However, research conducted to date indicates no aversion of bats to either operating or inactive wind turbines, with many bats known to investigate both operating and non-operating wind turbines (Horn et al., 2008). As a result, no disturbance of bats during operations is anticipated.

4.3.10.3 Residual Effects

Potential impacts to bats will be restricted to potential mortality from collisions with turbines or barotrauma from entering into the region of variable pressure which surrounds wind turbines. Based on results of mortality monitoring from North America, and specifically from nearby sites within the province of Ontario, it is expected that bat mortality will occur on the order of 4 to 5 bat fatalities/ turbine/year. Mortality at this level would be consistent with wind power facilities throughout North America and would be well below those sites in eastern portions of the United States where significant levels of mortality have been recorded.

4.3.11 Other Wildlife

4.3.11.1 Construction

Impacts to other species of wildlife could occur as a result of loss of habitat, disturbance from construction activities, or incidental mortality as a result of collision with construction vehicles.

Habitat lost for the Project will be restricted primarily to agricultural lands, with minor losses from roadside vegetation strips. Wildlife species that would be most impacted by these losses would be small mammals, such as mice and voles, and reptiles that might be found in these environments. Given the large amount of these habitats that are found in the area, no impact to the carrying capacity of the region for these species is anticipated.

As with birds and bats, construction activities will primarily occur in agricultural fields where wildlife use is restricted when compared to forest habitats. Therefore, any avoidance of active work areas as a result of disturbances from construction activities is anticipated to be minor, and, given the high levels of disturbance that occur in this area, some existing tolerance of anthropogenic presence is anticipated. Any movement away from work areas would be expected to be temporary, with wildlife species returning to the vicinity of these sites following completion of construction activities. Therefore, no residual adverse effect is anticipated with respect to wildlife disturbance during construction.

Incidental mortality of wildlife species could occur as a result of the movement of construction vehicles and machinery around the work area. Mitigation measures identified with respect to birds would be expected to be reduce the potential risk of wildlife mortality from construction vehicles. Mortality levels would be expected to remain around baseline levels of wildlife mortality from vehicles.

Further, daily visual monitoring of the work areas and construction machinery will be completed to search for snakes and turtles to ensure that potential impacts to these species are minimized. In addition, the construction workforce will be made aware of the potential for wildlife occurring on the Project site and that measures should be taken to avoid wildlife wherever possible. In order to reduce the possibility that any Species at Risk snakes may be hit while basking on roadways, workers will be forewarned of the possibility of snakes on roadways, and will be provided with tips on what to look for and how to safely avoid such collisions. If wildlife are observed on the Project site, they will be either directed off of the Project site by the worker (without the use of vehicles) or collected by a designated employee, who has been provided with protocols for the safe handling and transport of wildlife, and transported to the nearest available location off site and released.

Should a snake be killed as a result of a collision with a construction vehicle, the species will be identified, and if it is a Species at Risk, the Ontario MNR or EC will be immediately notified of the incident. As being in possession of a Species at Risk is considered an offence under the Species at Risk Act and the Ontario Endangered Species Act, any snakes killed by construction vehicles are to be moved to the side of the road and left in place following identification.

4.3.11.1.1 Significant Animal Movement Corridor (from NHA/EIS in Appendix H)

There will be no direct encroachment or vegetation removal from any portion of the animal movement corridor required for construction of the access road. As the access road will be located less than 5 m from the boundary of the hedgerow, in order to ensure that there is no accidental

encroachment into the feature, the boundaries will be demarcated prior to construction, and silt fence installed at 1 m from the boundary of the hedgerow. The installation of silt fence will ensure that

- there is no sediment transport from work areas into Jenson Drain
- there is no accidental encroachment of construction personnel into the feature
- stray wildlife movement from the corridor onto the Project location is restricted, thereby significantly reducing the potential for wildlife encounters.

In addition to the above, soil-moving activities, access road construction, and vehicle travel along the access road may result in dust deposition within the hedgerow, which could impact vegetation growth within the hedgerow. In order to mitigate these effects, the document entitled "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (Cheminfo Services Inc., 2005) will be used as a guideline for contractors. Mitigation measures to be used, as required, to control dust include

- use of approved dust suppression (i.e., water or non-chloride based materials) on exposed areas including access roads, stockpiles and works/laydown areas as necessary
- hard surfacing (addition of coarse granular A material, free of fine soil particles) of access roads or other high-traffic working areas
- avoid earth-moving works during excessively windy weather. Stockpiles to be worked (e.g., loaded/unloaded) from the downwind side to minimize wind erosion
- stockpiles and other disturbed areas to be stabilized as necessary (e.g., tarped, mulched, graded, revegetated or watered to create a hard surface crust) to reduce/prevent erosion and escape of fugitive dust.

Visual monitoring of dust generation will occur during the construction period and if dust is observed to be of concern, additional mitigation will be implemented. Given the mitigation and monitoring proposed, it is anticipated that dust generation will be relatively low in magnitude and limited in duration and geographical area, such that no negative effects on vegetation communities of the hedgerow will occur as a result of dust.

The use of the above mitigation measures will ensure that there is no impact on the form of the animal movement corridor within the hedgerow.

Construction of the access road and vehicle travel during construction along the access road may result in some disturbance of animal movement within the corridor, thereby impacting function. It is not possible to mitigate this effect. This impact would be temporary in nature, primarily associated with the time required for access road construction. As construction will occur during the day, movements of nocturnal animals would not be impacted. Therefore, construction may result in a temporary, short-term impact on diurnal wildlife movement within the corridor. Given the short time frame associated with construction activities, this disturbance would not be expected to impact wildlife movement between critical habitat features, and therefore impacts on the function of the corridor is negligible.

Incidental take of wildlife may occur from individuals that stray onto the Project location from the movement corridor. In order to minimize the potential for incidental take of wildlife, speeds on access roads of the Project location will be restricted. Further, daily visual monitoring of the project location and construction machinery will be completed to search for wildlife to ensure that potential impacts to these species are minimized. In addition, the construction workforce will be made aware of the potential for wildlife occurring on the Project location and that measures should be taken to avoid wildlife wherever possible. Further, the access road in proximity to the corridor will be identified to the workforce as an area of high potential for wildlife. The construction workforce will be provided with protocols for wildlife encounters, should wildlife be encountered during construction activities. The use of the above mitigation measures, in association with the silt fence previously discussed, will ensure that potential for incidental take is minimized.

4.3.11.1.2 Species at Risk

Though none were observed during baseline investigations, locations of project components will be searched prior to construction for the any evidence of habitat for wildlife species at risk, including Eastern Fox Snake, Eastern Milksnake, and American Badger. A plan for this construction monitoring will be developed with EC and MNR prior to the commencement of construction (preliminary details are provided in Section 6). If these features are observed, project components will be relocated in order to avoid any potential impacts on these species.

4.3.11.2 Operations

Impacts to other species of wildlife during the operations period could occur as a result of incidental mortality from collisions with maintenance vehicles, or wildlife disturbance from maintenance activities/turbine operation.

Mitigation measures identified with respect to construction activities should be effective at minimizing potential for incidental mortality from movement of maintenance vehicles. Further, the anticipated infrequent nature of maintenance visits should reduce potential occurrences of wildlife mortality to a negligible level.

Wildlife disturbance from maintenance activities would be expected to be minimal. Maintenance workers will be required to remain on previously disturbed lands whenever possible, and the anticipated infrequent nature of site visits should result in limited disturbance to these species. Some species sensitive to the presence of workers within their habitat may move away from the work area, however maintenance activities should be short term in nature and wildlife would be expected to return following the completion of work.

Some species of wildlife may also be disturbed by the presence of the operating turbines. To date, there have been no studies documenting potential impacts of disturbance of operating turbines on wildlife beyond birds. Though some initial disturbance may occur, it is anticipated that adaptation to the presence of the wind turbine in the local environment would take place, and any abandoned locations would be recolonized.

4.3.11.2.1 Significant Animal Movement Corridor (from NHA/EIS in Appendix H)

Operation of the Project is not expected to impact wildlife habitat in the animal movement corridor as activities in proximity to the corridor will be restricted to vehicle movement along the access road.

Maintenance activities requiring use of this access road are expected to be infrequent and therefore, disturbance of wildlife within the animal movement corridor is not anticipated.

As during construction, there is potential for wildlife to stray from the animal movement corridor onto the access road, which may result in occurrences of incidental take. In order to minimize this potential, mitigation measures previously identified in Section 4.3.11.1.1 will be followed to ensure that the risk of incidental take is minimized.

The use of the above mitigation measures will ensure that there is no impact on the form or function of the animal movement corridor within the corridor during operations.

4.3.11.3 Residual Effects

During construction, some minor loss of wildlife habitat and incidental mortality of wildlife species is expected to occur. Though present, these residual effects are not anticipated to impact local abundance of wildlife species or carrying capacity of the local habitat.

During operations, any effects on other species of wildlife are expected to be temporary and short term, and therefore no residual effects are expected.

4.3.12 Parks and Significant Natural Areas

As none of the Parks and Significant Natural Areas identified in Section 3.3.5 overlap the Project location, no effects on the natural environment or ecological integrity of these features are anticipated as a result of the Project.

4.3.13 Air Quality

4.3.13.1 Construction

Potential impacts to air quality during construction could occur as a result of the migration of fugitive dust off site and the use of internal combustion engines.

Dust may become airborne from vehicular traffic, heavy machinery use, and soil moving activities. Dust in the air can have a range of effects including, but not limited to

- impacts on human health as a result of irritation to lungs, eyes, etc, which could impact construction workers or nearby residents
- impacts on surface water quality and aquatic habitat if the dust is deposited into the watercourses
- impacts on vegetation if heavy dust loads build up on photosynthetic surfaces, thereby resulting in mortality of the plants.

In order to mitigate potential impacts of fugitive dust displacement, the use of standard construction best management practices and mitigation measures, such as those identified in "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (Cheminfo Services Inc., 2005), will be used. These mitigation measures are to include, as required

- use of dust suppression (i.e., water) on exposed areas including access roads, stockpiles and work/laydown areas as necessary
- hard surfacing (addition of coarse rock) of access roads or other high-traffic work areas

- phased construction, where possible, to limit the amount of time soils are exposed
- avoid earth-moving works during excessively wind weather. Stockpiles to be worked (e.g., loaded/unloaded) from the downwind side to minimize wind erosion
- stockpiles and other disturbed areas to be stabilized as necessary (e.g. taped, mulched, graded, revegetated or watered to create a hard surface crust) to reduce/prevent erosion and escape of fugitive dust
- dust curtain to be used on loaded dump trucks, delivering materials from off site but will not be used on heavy equipment at site
- workers to utilize appropriate personal protective equipment (e.g., masks, safety goggles) as necessary.

The use of these mitigation measures would be expected to mitigate most effects of dust on local air quality, with any impacts expected to be temporary in nature.

In addition to impacts from dust, a variety of construction, haulage and personnel vehicles, as well as portable generators will be used on site during the construction period. The use of this equipment will result in exhaust emissions containing carbon monoxide, nitrogen oxides and sulphur oxides. As a best management practice, vehicles are to be run only when necessary and exhaust equipment (e.g., pollution control devices) are to be inspected regularly. The contractor is to limit unnecessary idling of construction equipment when not involved in a construction activity. Operation of this equipment will result in some minor decrease in air quality in the immediate vicinity of operating equipment, however this will be temporary in nature and emissions would be expected to dissipate following the equipment being shutdown or its movement out of the affected area.

As both of these effects are temporary in nature and will result in only short term minor impacts on local air quality, no residual effect from construction activities is anticipated.

4.3.13.2 Operations

Potential impacts during operations could occur from the movement and operation of maintenance vehicles resulting in exhaust emissions and fugitive dust generation. The anticipated infrequent nature of maintenance activities at the site will result in negligible impacts on air quality from both of these sources. There is therefore no anticipated effect from maintenance activities associated with the Project on local air quality.

Operation of the wind turbines themselves will not result in any impacts to local air quality.

4.3.13.3 Residual Effect

Overall, as any impacts to air quality are anticipated to be minor and/or temporary, no adverse residual effect on air quality is anticipated as a result of construction or operation activities.

4.4 Social Impact Assessment

4.4.1 Employment and Local Economic Benefit

4.4.1.1 Construction

The construction of the Project is anticipated to have a positive effect on local and regional employment and industry as a result of the construction activities listed in the beginning of Section 4 (i.e., land clearing, foundation construction, etc) in the form of employment of local construction workers and businesses for road construction, equipment and supplies, vehicle rental, waste disposal services etc. There will be a requirement for both skilled and unskilled labour originating locally and non-locally based on qualification.

Positive indirect and induced economic benefits are also anticipated based on an immigration of workers for the construction period, and their requirement for accommodation, fuel and other services.

4.4.1.2 Operation

Benefits of the Project during operation and maintenance will include employment and contracting of local workers and area businesses for various activities having both a direct and indirect impact on the local economy.

4.4.1.3 Residual Effect

No adverse residual effects to employment or the local economy are anticipated as a result of the Project.

4.4.2 Agricultural Land Use

4.4.2.1 Construction

A temporary loss of approximately 3.9 ha is anticipated during construction clearing as follows:

- access road construction: 3.3 km length x 9 m width (reduced to 3 m width during operation)
- WTG foundation construction: 40 m diameter (approximately 1257 m^2) x 5 WTGs
- crane pad area: 20 m x 30 m x 5 WTGs
- construction works yard/laydown area: 100 m x 100 m.

The following mitigation measures will ensure that minimal disturbance to surrounding agricultural land occurs, and that unnecessary damage or disturbance to agricultural areas is avoided:

- all staff and site visitors are to remain within pre-determined areas
- clearing widths for roads and foundations are to be minimized to the extent possible
- access roads constructed are to be closed to the public during construction activities
- site remediation to take place immediately following construction including repairing of any tile drainage, and restoration of temporary construction areas to pre-construction condition.

4.4.2.2 Operation

It is estimated that construction of the Project will result in the permanent loss of approximately 1.2 ha of agricultural land. During the operation of the Project, areas utilized for access roads (3.3 km x 3 m) and at the base of the turbines (~10 m diameter foundation) will remain unavailable for agricultural land use. These areas will be minimized to the extent possible, and compensation to the landowner in the form of land lease payments is anticipated to supplement landowner income.

4.4.2.3 Residual Effect

The adverse residual effect of the Project on agricultural land use will be a loss of some agricultural lands during the construction and operation of the Project.

4.4.3 Tourism and Recreation

4.4.3.1 Construction/Operation

Recreational activities are not known to exist within the Project location. These activities are located within larger towns including Chatham-Kent. The closest recreational activities are located in the nearby municipality of West Elgin, and to the south along Lake Erie.

As stated in Section 4.3.12 none of the Parks and Significant Natural Areas such as Rondeau Provincial Park, overlap the Project location. No effects on the natural environment or ecological integrity of these features are anticipated as a result of the Project; therefore no effects to the tourism or recreational resources are expected as a result of the construction or operation of the Project.

4.4.3.2 Residual Effects

No adverse residual effects are anticipated with respect to tourism or recreational resources.

4.4.4 Cultural Heritage Resources

4.4.4.1 Construction/Operation

4.4.4.1.1 Archaeological Assessment

A Stage 1 Archaeological Assessment was completed for the Proposed Gesner (Highgate) Wind Power Development (see Appendix E). The report concluded that the lands within the Project location have at least a moderate potential for as-yet undiscovered archaeological remains. It was recommended by D.R. Poulton and Associates that a Stage 2 Archaeological Assessment be carried out once the detailed design for the proposed development has been determined.

A Stage Two Archaeological Assessment was completed for the Proposed Gesner (Highgate) Wind Power Development (see Appendix E). No archaeological artifacts were recovered during the Stage 2 survey, which consisted of on-site investigations. Several recommendations are provided within the report to ensure that no significant adverse effects to archaeological resources occur during construction:

- It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed the archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the

report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.

- Although every reasonable effort was made to locate all archaeological resources, it is possible that some remain to be discovered within the study area. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and are therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act. Mayer Heritage Consultants Inc. in St. Thomas (519-637-6200 or 800-465-9990) should be immediately notified.
- As on virtually any property in southern Ontario, it is possible that Aboriginal or Euro-Canadian burials could be present within the study area. The Cemeteries Act, R.S.O.1990 c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the appropriate municipal police, the local coroner, the Registrar of Cemeteries at the Ministry of Consumer Services (416-326-8392), and Mayer Heritage Consultants Inc.
- The licensee shall keep in safekeeping all artifacts and records of archaeological fieldwork carried out under this licence, except where those artifacts and records are transferred to by the licensee to Her Majesty the Queen in right of Ontario or the licensee is directed to deposit them in a public institution in accordance with subsection 66(1) of the Act.

4.4.4.2 Residual Effect

Careful adherence to the above mitigation measures will avoid any adverse residual effects on cultural and heritage resources.

4.4.5 Property Values

4.4.5.1 Construction/Operation

The evaluation of the effect of a wind farm on local property values is multifaceted and complex, with a number of parameters to be considered. Any change in value can be related to numerous factors including the economy, location and property amenities. It is therefore difficult to predict changes to property values, and even more difficult to attribute any changes to one factor, i.e., neighbouring wind farm development.

Given that the above, a limited number of investigations have been conducted into the potential effect of wind farm construction on real estate value. Once such study has been conducted by Blake, Matlock and Marshal Ltd. for Windrush Energy, entitled *Property Value Study: The Relationship of Windmill Development and Market Prices*. The study examined property values between 2002 and 2006 during which time the Melancthon wind farm was constructed (2005). The study sought to compare property values within Melancthon Township (both prior and following wind farm construction), East Luther Grand Valley Township (within which there has been no wind farm construction) and the greater Dufferin County (within which the two townships are located). The following findings were concluded following the study:

> *The Township of Melancthon and the Township of East Luther Grand Valley are neighbouring communities located in Dufferin County which are noticeably similar in many ways. The most notable difference between these communities is the existence of windmill development. The Township of Melancthon has demonstrated consistent patterns of growth on most accounts despite being the topic of windmill development and similar growth to Dufferin County as a whole which included the communities absent of this energy characteristic. The Township of Melancthon has further demonstrated superior growth to the Township of East Luther Grand Valley which is devoid of windmill development and which produced inferior growth to Dufferin County statistics. The economics and environmental circumstances surrounding this large scale energy initiative therefore are not seen to have diminished property value but rather to have arguably nourished property value by its presence. Annualized growth figures provide concise and self-evident findings as added testimony to the positive conclusions drawn regarding the relationship of windmill development on property values* (Blake, Matlock and Marshal Ltd., 2006).

Further information is provided on the issue within the Renewable Energy Policy Project Report, or REPP Report of 2003: *The Effect of Wind Development on Local Property Values*. The REPP Report was commissioned by the US Government and studied 10 projects in 10 states for a period extended 3 years prior to construction and 3 years post-construction. These areas were compared with an area within the same state having similar characteristics. The study concluded that in nine states, property values rose more quickly within the viewshed of a wind farm (viewshed defined to be an 8 km radius), and in one state property values grew at comparable rates. The recommendation of the report was that "the results of this analysis of property sales in the vicinity of the post-1998 projects suggest that there is no support for the claim that wind development will harm property values" (Sterzinger et al., 2003).

4.4.5.2 Residual Effect

Based on the information presented in the previous section, it is not anticipated that the construction and operation of the Project will have a negative effect on neighbouring property values. No adverse residual effect is anticipated.

4.4.6 Sound Levels

4.4.6.1 Construction

Construction is scheduled to occur from March 2011 to September 2011. Construction activities during this time have the potential to result in increased noise levels in the Project location and immediate surroundings. There are some noise sources associated with construction activities which have the potential to temporarily affect residents by increasing noise levels during construction. The Municipality of Chatham-Kent noise by-law will limit the hours available for construction to the period from 7 a.m. to 11 p.m. (Monday to Saturday with the exception of statutory holidays). All construction equipment will be expected to meet the requirements of MOE publication NPC 115 – Construction Equipment. This will be made known to the contractor via the project specifications and the Environmental Protection Plan.

4.4.6.2 Operation

Operation of the proposed project has the potential to result in increased noise levels within the Project location. An Acoustic Assessment to be submitted as part of the application for Renewable Energy Approval has been prepared in accordance with MOE's *Noise Guidelines for Wind Farms: Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities, October 2008* in order to assess these potential impacts. The report is provided in Appendix A and the results are summarized below.

The noise level estimates included in this report are calculated for a proposed wind turbine layout comprised of five 2-MW Gamesa wind turbine generators (two Gamesa G-97 and three Gamesa G-97W), with a hub height of 90 m. The available lands used in this assessment are leased by Saturn Power Inc., and are the same lands presented to stakeholders during the public consultation. Wind turbine locations have been determined in consideration of noise compliance and also compliance to the setbacks required by Ontario Regulation 359/09 as issued following the Green Energy Act, 2009.

The closest residences to the proposed facility were identified to be the sensitive points of reception (POR). The sound pressure levels at the POR were calculated based on sound power levels provided by the wind turbine manufacturer. The sound power levels were estimated at the POR using a computer model based on ISO 9613-2, and assuming worst-predictable case conditions and parameters, as specified in the Noise Guidelines for Wind Farms (MOE, 2008).

The predicted sound pressure levels at the POR show that the Gesner Wind Power Project is noise compliant, with levels at all POR below 40 dBA, the maximum limit set by the MOE for Class 3 Areas (Rural).

4.4.6.3 Residual Effect

Based on the Acoustic Assessment, the sound levels emitted by the facility will not produce noise levels at any POR that exceed the limits established by MOE.

4.4.7 Visual Landscape

4.4.7.1 Construction/Operation

4.4.7.1.1 Visualization

Hatch undertook modeling to illustrate the visual impact of the Project. The following sections provide the process and methodology for producing the visualizations.

Visual Modeling Process

The *WindPro V.2.6.1.152* (WindPro) commercial software package, developed by EMD (www.emd.dk) was used to determine the visual impact of the wind farm. *WindPro* is a fully integrated modular software package that is recognized and accepted worldwide by developers, planners, utilities and WTG manufacturers. The model is widely used for design and planning of large wind farms.

The VISUAL module within the software was used to produce a photomontage, in which turbines are placed in a landscape photograph. The technique behind a photomontage is to establish a camera model that can transform any point with known elevation and coordinates from a map to a

2-dimensional photo. Once the camera model is established, the program can then position a model of a turbine into the image with the correct proportions (EMD International A/S, 2008).

Modelling Parameters

The parameters used to develop the photomontage include

- GPS positions of the wind turbines: see Table 4.2 below
- Turbine Make and Model: 2 Gamesa G97 and 3 Gamesa G97W wind turbines, 90-m hub height, 97-m rotor diameter
- Camera Focal Length: 28 mm
- Camera Height: 155 cm
- Predominant Wind Direction: west
- Date and Time of Photograph: 12:30 p.m. on April 23, 2009
- Camera Position and Direction Bearing: see Table 4.2 below.

Upon establishing the above parameters, it is then necessary to modify the tilt and rotation angle of each photograph in order to match the horizon line with the digital elevation contours. This ensures that the turbines are placed within the correct position and orientation.

Table 4.2 GPS Coordinates of Camera Positions for Each Photograph

Photo ID	Easting	Northing	GPS Code	Description	Direction of Photo (Center)*
1	443553	4703464	193	CR 3	305
2	437936	4705949	195	Duart Rd (Duart)	20
3	436680	4707039	196	Duart Rd (Muirkirk)	76
4	437657	4711454	200	401 - North of MET tower	167

*Degrees clockwise from north

Visualization Results

Four visualization images were produced to assist in visualizing the impact of the wind farm. A photo location map and the visualization images are included as Appendix F.

4.4.7.1.2 Turbine Lighting

Subject to Transport Canada's Canadian Aviation Regulations (CARs) *Part VI General Operating and Flight Rules – Standard 621.19 – Standards Obstruction Markings*, turbine lighting will be required for some of the turbines within the Project. Transport Canada has approved, through the Aeronautical Obstruction Clearance, a lighting scheme whereby three of the five turbines (WTG 1, 2, and 5 shown in Figure 4.1) will be lit.

Transport Canada has provided guidance on the standards for applying marking and lighting of wind turbines and wind generation facilities of heights between 90 and 150 m above ground level (including the turbine blade) to assist in the interpretation of the standards, the most recent draft

being *CAR621.19 Advisory Circular 1/06 – DRAFT 9*. According to the draft, factors considered in its development include consideration of the impact to the night sky and light pollution, stating:

> The clarity of the night sky is of importance not only for the many people who casually or seriously maintain personal astronomical observatories, but also to our spiritual well being. Unfortunately, by inappropriate use of lighting, we are progressively degrading our view of the night sky. Thus, the designer should pay particular attention to minimizing the adverse impact of lighting applied to windfarms. In general, red lighting should be used.
>
> The physiology of the human eye in low light levels is well understood. The eye is most sensitive to blue-green light. Moreover, the sensitivity shifts significantly away from red, hence, red illumination sources do not contribute to the loss of night vision (Transport Canada, 2006).

In consideration of the above, Transport Canada is developing new standards to be considered and implemented in planning new wind energy developments. To reduce the potential negative effects of turbine lighting, the following is expected to be required for the Project:

- red obstruction lighting of 1800 candelas
- not all WTGs will be required to be lit
- no daytime, or white obstruction lighting
- all lights would flash simultaneously
- the angle of the beam will be adjusted to minimize lighting observed at ground level, while angled to be brightest within the accepted flight path of aircraft.

Given the topography of the study area, which is relatively flat, and the absence of obstructions of view, it is anticipated that the wind farm will be visible throughout the surrounding area. Obstruction lighting will be minimized to the extent possible as detailed within the guidance document above, but must satisfy the requirements of Transport Canada to ensure public safety. The effect of the WTG lighting is considered to be minimal given the number of turbines.

4.4.7.2 Residual Effect

The presence of the wind farm will represent a change to the visual landscape in the vicinity of the Project. The turbines will be visible in the surrounding area and fitted with navigational lighting. The turbines have been sited to cause the least amount of visual disturbance. While some consider this change in visual landscape to be an adverse residual effect based on individual perception, others express their consideration of this change in visual landscape as favourable.

4.4.8 Community Safety

4.4.8.1 Construction

Safety is a concern on any construction site and will be considered carefully in construction planning and throughout all phases of the construction of the Project. Safety considerations pertinent to the Project must consider not only the preservation of public safety, but also that of the construction

workforce. The following mitigation measures are recommended to protect public safety in the vicinity of construction activities:

- prevention of public access to the construction site through the use of fences, gates, and security procedures
- posting of signage to notify the public of construction in the area
- adherence by workers to prescribed procedures such as required cleared radius during any blasting activities
- development of proper procedures for construction traffic.

In addition to the above, additional mitigation measures will be required to ensure the safety of on-site workers during construction:

- completion of safety training by all workers
- strict adherence to the Ministry of Labour occupational health and safety regulations pertaining to construction sites regarding worker safety
- first-aid equipment to be maintained on site (as appropriate to construction activities)
- Material Safety Data Sheets (MSDS) for any hazardous material used on site to be available close to the location where the material is used and stored
- an accident and emergency spill response plan
- spill containment and clean up materials to be maintained on site
- completion of training for spill situations (additional information on accidents including spills is provided in Section 4.8).

4.4.8.2 Operation

Following the construction of the Project, any hazards to public safety will be restricted to the presence and operation of the turbines. The WTG towers will be locked, and any associated structures will be fenced and gated. Potential effects of the Project's operation to public safety, although unlikely, include collapse of tower, loss of turbine blades and ice throw. Mitigation measures to prevent these effects will be incorporated into the design of the turbine model, Project layout and operation, often including

- foundation/structural design resistant to earthquakes and other environmental loadings
- not operating turbines during freezing rain conditions conducive to ice load on blades
- turbine lighting (3 of 5 WTGs) to preserve aviation safety
- location of WTGs an acceptable distance from any neighbouring dwellings.

4.4.8.3 Residual Effect

The adverse residual effect of the Project following appropriate mitigation remains a potential risk to public and workplace safety.

4.4.9 Local Traffic

4.4.9.1 Construction

Potential negative effects to the local infrastructure include increased local area traffic and temporary disruption along routes used resulting in delays to the local community traffic, and increased traffic as a result of equipment and turbine deliveries to the Project location. According to the manufacturer, the delivery of turbine components will require a total of 58 trucks, not including the spare parts that may be delivered at the same time. The majority of trucks are required for the towers (25 trucks), blades (15 trucks), nacelles (5 trucks) and hubs (5 trucks). The following mitigation measures will be implemented to reduce or eliminate negative effects of the Project on local area traffic:

- establish routes to avoid tight turning areas and delays
- check on overhead lines which would require removal and have the appropriate utility available to assist as necessary
- a police escort or security company will guide/accompany any transport convoys as necessary
- post signage to notify traffic and trail users of construction, as necessary
- vehicle will be driven in proper manner and drivers will respect all traffic laws, regulations, and company policies
- vehicle imprints or erosion gullies will be regraded.

4.4.9.2 Operation

It is expected that any negative effects to traffic, incurred during construction of the Project would return to baseline levels following construction completion.

4.4.9.3 Residual Effect

The anticipated adverse residual effect of the Project on local traffic is temporary disturbance to traffic during construction.

4.4.10 Radiocommunication Systems

4.4.10.1 Construction/Operation

The operation of a wind energy facility has the potential to interfere with radiocommunication systems in the Project's vicinity. Various federal agencies and stakeholders have been contacted to determine any potential effects. This consultation effort is presented in detail within the Consultation Report (to be submitted with the REA application), based on which it has been determined that there are no microwave links near the Project location (the closest being located in Chatham-Kent), and that there are two land mobile station operators located within the 5 km consultation radius surrounding the center of the proposed project. According to consultation with these stakeholders, there is no reasonable expectation that they will be affected by WTG operation in the vicinity.

4.4.10.2 Residual Effect

No adverse residual effect to radiocommunication is anticipated as a result of the Project.

4.4.11 Waste Management and Disposal

4.4.11.1 Construction

Waste generated during the construction of the Project may include waste oils, recyclable material, and municipal hazardous and sanitary waste. Any waste (e.g., municipal, hazardous, recyclable and sanitary) generated during the construction and operation of the facility will be transported by a MOE licensed hauler to MOE licensed facilities with approval to accept those types of wastes generated (see Sections 4.1.8.4 and 4.1.9).

4.4.11.2 Operation

During operation, the generation of wastes and hazardous materials will be properly disposed in accordance with municipal waste and MOE disposal guidelines (see Sections 4.1.8.4 and 4.1.9).

4.4.11.3 Residual Effect

The adverse residual effect of the Project on waste management and disposal sites will be a negligible increase in the disposal of waste materials at licensed facilities.

4.5 Significance of Adverse Residual Effects

A determination of the significance of any residual effects after mitigation is required. The determination of significance is based on CEA Agency's Determining Whether a Project is Likely to Cause Significant Environmental Effects (CEAA, 2009).

The following significance criteria were used to identify the significance of the residual effects:

- magnitude of the effect
- geographic extent of the effect
- duration and frequency of the effect
- irreversibility of the effect
- ecological context.

Table 4.3 provides the definitions for the levels of significance criteria.

Table 4.3 Adverse Residual Effects Significance Criteria and Levels

Criteria	Effect Level Determination		
	Low	Moderate	High
Magnitude (of effect)	Effect is minor or inconsequential.	Effect is moderate and may or may not be trigger or contribute to any cumulative environmental effects.	Effect is major or catastrophic.
Geographic Extent (of effect)	Effect is limited to the Project location.	Effect extends beyond the Project location into the adjacent local area (< 300 m).	Effect extends beyond the local area and into the regional area (> 300 m).

Criteria	Effect Level Determination		
Duration and Frequency (of effect)	Effect is evident only during construction activities and occurs infrequently and/or for short durations.	Effect is evident during the operational period and occurs infrequently and/or for short durations.	Effect is evident during the operational period and occurs frequently and/or for long durations.
Reversible/Irreversible (of effect)	Defined as reversible (effected area returns to existing conditions (generally) immediately or over time) or irreversible (effected area never returns to existing conditions).		
Ecological Context (of effect)	Effect occurs in a region having already been adversely affected by human activities.	Effect occurs in a region with moderate ecological fragility/resilience to effect.	Effect occurs in an ecologically fragile region having little resilience to imposed stresses.

Adverse residual effects of the Project, following mitigation, were determined in Sections 4.3 and 4.4. These have been carried forward into Table 4.4, where significance criteria has been applied to determine whether significant residual effects are anticipated as a result of the Project.

Table 4.4 Summary of Adverse Residual Effects and Significance

		Significance				
Environmental Component	**Adverse Residual Effect**	**Magnitude**	**Geographic Extent**	**Duration and Frequency**	**Reversibility**	**Ecological Context**
Birds	Disturbance from construction activities	Low	Moderate	Low	Reversible	Low
	Loss of habitat as a result of construction	Low	Low	High	Reversible	Low
	Incidental mortality as a result of the movement of construction vehicles/ machinery across the Project location during construction	Low	Low	Low	Irreversible	Low
	Fatalities as a result of collision with aboveground cabling and wind turbines during operations	Low	Low	Moderate	Irreversible	Low
	Disturbance as a result of wind turbine operations	Low	Moderate	Moderate	Reversible	Low
Bats	Fatalities as a result of collision with operating wind turbines, or barotraumas from entering into the region of variable pressure which surrounds wind turbines	Low	Low	Moderate	Irreversible	Low

		Significance				
Environmental Component	**Adverse Residual Effect**	**Magnitude**	**Geographic Extent**	**Duration and Frequency**	**Reversibility**	**Ecological Context**
Other Wildlife	Incidental mortality as a result of the movement of construction vehicles/ machinery across the Project location during construction	Low	Low	Low	Irreversible	Low
	Loss of habitat as a result of construction	Low	Low	High	Reversible	Low
Agricultural Land Use	Loss of agricultural lands during the construction and operation of the Project	Moderate	Low	High	Reversible	Moderate
Visual Landscape	Change to Visual Landscape*	Moderate	High	High	Reversible	Low
Community Safety	Potential risk to public and workplace safety	Moderate	Low	Moderate	Reversible	Moderate
Local Traffic	Disturbance to traffic during construction	Low	Moderate	Low	Reversible	Moderate
Waste Management and Disposal Sites	Increase in the disposal of waste materials at licensed facilities	Low	High	Low	Reversible	Low

* Included in evaluation based on perception as an adverse residual effect.

Based on the evaluation above, none of the adverse residual effects of the Project are determined to be significant. Therefore, there are no significant adverse residual effects on which likelihood must be established.

4.6 Decommissioning Plan

A 25-yr lifespan is typically anticipated for wind turbines. At that time, turbines will be decommissioned or refurbished depending on market conditions and/or technological changes. This section identifies the dismantling procedures, the management of waste generated as a result of project decommissioning, and the site restoration procedures to be employed. The procedures identified in this decommissioning plan would also be followed were the site to be abandoned during construction.

4.6.1 Dismantling/Demolishing Procedures

Wind turbines and meteorological towers will be dismantled according to manufacturer specifications. It is anticipated that turbine components will be dismantled in reverse order to which they were erected, with the use of a crane. Turbine components will then be loaded onto trucks for removal from the site.

Similarly, interconnection cabling will be excavated and removed from the property.

Concrete foundations will be mechanically demolished, and access roads mechanically excavated, unless the landowner requests otherwise. The culvert crossing Peets Drain will be removed and the

location restored according to a plan to be developed in consultation with the Lower Thames Valley Conservation Authority.

4.6.2 Excess Material and Waste Management Procedures

All waste materials will be reused or recycled wherever possible; for example, it is anticipated that granular material removed from road surfaces may be reused elsewhere. Any material that cannot be reused or recycled will be disposed of at an approved landfill location in accordance with waste management regulations.

Any hazardous material will be disposed of at a licensed hazardous waste storage or disposal facility. Hazardous wastes will be packaged for transport and disposed according to applicable regulations. Waste manifests will be prepared and submitted according to applicable regulations prior to transport.

4.6.3 Negatively Affected Land Restoration

Once the access roads, turbines, and foundations are removed from the site, site cleanup and regrading to original contours will be completed.

Any remaining waste materials found on the site will be collected and disposed of as outlined in Section 4.6.2.

Clean earthen fill consistent with native materials will be placed within any voids created as a result of decommissioning. In addition, soils beneath access roads will be disced to remove some of the compaction that will have developed throughout the years of operation; additional materials will be added as needed to restore the site to original contours.

Any damage to the tile drainage system that was created as a result of construction, operations, or decommissioning of the facility will be repaired/replaced.

Finally, planting of leguminous crops will occur in order to provide a rapid return of nutrients and soil structure. A soil quality monitoring program will be instituted following decommissioning in order to ensure that soils quality is restored, or improved, from existing conditions prior to construction. The land is thus restored to its agricultural use as currently exists.

4.7 Accidents and Malfunctions

Accidents or malfunctions are considered to be those effects resulting in unintentional negative consequences. Accidents or malfunctions may occur as a result of construction or operation phase activities. These are described separately below.

Construction and operation activities were examined in order to determine potential malfunction and accident scenarios. The assessment of possible malfunctions and accidents include: an identification of these occurrences that are associated with Project activities, the safeguards and/or mitigation measures that have been and/or will be established to protect against such occurrences, along with the emergency/contingency response procedures in place if an accident/malfunction does occur.

Appropriate mitigation measures are implemented throughout the construction and operation phases of the Project to reduce, to the extent possible, any adverse effects on the physical and social environment. Mitigation measures such as those proposed in Section 4.4.8 – Community Safety, and

Section 4.4.9 – Local Traffic, are considered to be safeguards to protect against potential accidents during construction. In addition, the following accidents and/or malfunctions have the potential to occur during construction of the Project.

4.7.1 Accidental Spills

Predominantly during construction, accidental spills have the potential to occur, and appropriate safeguards will be put in place to prevent contamination of the terrestrial or aquatic environments. Contaminants that will be used during construction and have the potential to be spilled consist of petroleum hydrocarbons (from fuel storage and transport, vehicle maintenance and in transformers), sewage (from portable toilets), and silt (from clearing and earth-moving operations).

To mitigate the potential for spills during construction, the site engineer and environmental specialist will be responsible for ensuring that the Project is constructed using best environmental management practices. The following measures will be implemented.

- A designated Site Environmental Inspector will be appointed. This person will be responsible for ensuring that the contractor(s) have prepared a spill clean-up procedure/emergency response plan, with all staff trained in proper implementation in the event of a spill.
- Emergency Contacts will be posted, including 911, Police, Fire Department, MOE Spill Centre.
- All potentially hazardous materials, fuels and lubricants must be stored in the laydown area, in a protected/bermed area and at least 30 m from watercourses/drains.
- All refuelling and equipment maintenance activities will be conducted at specified locations.
- Equipment is to be monitored to ensure it is well maintained and free of leaks.
- Spill containment and cleanup supplies are to be maintained on site at all times.
- Spill will be cleaned up immediately and reported accordingly.
- In the event of a reportable spill, the MOE Spills Action Centre is to be contacted immediately, as required by provincial regulations.
- Portable toilets will be located no closer than 50 m from a watercourse/drain and will be pumped by an MOE approved hauler to an approved facility.
- A sediment and erosion control plan will be developed and implemented.
- Erosion and sediment control systems must be installed in any location where erosion or sediment from stored soil/rock piles, access roads, clearings activities, etc, could discharge directly into a surface watercourse. An adequate supply of erosion and sediment control devices (e.g., silt fences) will be maintained on site during construction.
- If water has to be pumped from the foundation excavations, it must not be discharged directly into any surface watercourse. It must be pumped through filter bag/straw bales/vegetation to first remove the sediment. The discharge velocity must be dissipated to ensure there is no surface erosion at the hose end.
- The size of cleared and disturbed area is to be minimized where possible.

- Excavated, erodible material is to be placed in suitable designated areas away from watercourses and stabilized with erosion protection.
- During operation, appropriately sized and equipped spill kits will be located centrally.

4.7.2 Accidental Fires, Lighting

There are very few situations where a flame is required during construction activities; however, there are situations where a flame may be developed, such as sparks on mechanical equipment, discarded cigarettes or arson. In order to ensure that a fire is controlled, the Contractor will be required to develop fire-protection procedures in their Health and Safety Plan which will include the types of fire suppression equipment, communications, notifications and reporting protocols and initial response procedures as may be required.

Accidental fires caused by maintenance activities (where a flame is required) or caused naturally by lightning are a risk during operation. To mitigate, fire extinguishers will be located on maintenance vehicles and fire response procedures will be developed and tested. Damage to the WTGs would be anticipated to be minimal, as the turbine towers are constructed of steel, and the cabling between turbines will primarily be sub-terrain.

4.7.3 Ice Throw

4.7.3.1 Area of Probable Ice Throw

Under certain weather conditions there is a potential for ice to accumulate on the wind turbine rotor blades. This ice build up may be shed from the blades due to an increase in temperature, solar radiation, or wind, and in some cases, thrown from the rotating blades (Morgan et al., 1998; LeBlanc, 2007; Morgan and Bossanvi, 1996). This potential ice throw induces a risk within a certain range of each turbine.

The zone of likely ice throw can be defined as follows (*Expert Group Study on Recommendations for Wind Energy Projects in Cold Climates,* 2009; Seifert et al., 2003):

$$d = (D + H) \cdot 1.5 \qquad \text{(rotating turbine)}$$

$$d = v \frac{(D/2 + H)}{15} \qquad \text{(standstill turbine)}$$

Where:

d = *maximum throwing distance in m*

D = *rotor diameter in m*

H = *hub height in m*

v = wind speed at hub height in m/s.

For the Gamesa G97 and G97W turbine with a hub height of 90 m, the maximum probable throwing distance was estimated to be 281 m for a rotating turbine. For a standstill turbine, the zone of likely ice throw can reach up to 277 m at wind speed of 30 m/s (at hub height), or approximately 323 m at a wind speed of 35 m/s.

4.7.3.2 Risk Analysis

In addition to the empirical formulas used to estimate the ice throw risk zone, a detailed risk assessment methodology has been proposed. This methodology is described by Garrad Hassan in a report produced for the Canadian Wind Energy Association giving recommendations for risk assessments of ice throw in Ontario (LeBlanc 2007).

Based on sample calculations conducted in this report for typical icing conditions in Ontario, the critical distance, or "safe distance," was calculated to be 220 m for a generic 2.0-MW wind turbine with a rotor diameter of 80 m and a hub height of 80 m. Beyond this distance, the risk of injury was stated to be negligible (LeBlanc, 2007) It should be noted that the empirical formula previously described produces more conservative results (240 m safe distance) for the same generic turbine.

4.7.3.3 Ice Throw Results

The results show that beyond a distance of 281 m (323 m in extremely windy conditions) there is a negligible risk of impact due to ice throw. Based on the distance setbacks applied to the proposed wind farm layout all residences are located farther than 600 m away from the closest turbine, which puts them outside of the zone of likely ice throw.

4.7.4 Mechanical Failure

There is a possibility that malfunctions could occur if there are mechanical failures of the WTG components. If the power output is not consistent with the wind data, the turbine is programmed to shut down until maintenance is undertaken on the nacelle equipment. All machinery and equipment will be regularly inspected and maintained. WTGs will be monitored by a Selective Control and Data Analysis System (SCADA). This will allow for immediate notification of any malfunction.

4.7.5 WTG Failure

Extreme conditions (see Section 4.8 – Effects of the Environment on the Project), turbine foundation failure, and improper WTG installation represent possible contributing factors to WTG failure. WTG failure is however, rare and is not considered to be a major risk to public or workforce safety given adherence to Canadian safety and design standards.

4.8 Effects of the Environment on the Project

As required by CEAA (under the definition of 'environmental effect'), the following provides the effects to the Project that may be caused by the environment. The natural environmental conditions that could occur during construction and impact the Project include: inclement weather conditions such as extremely cold winter weather, extreme icing conditions and winds, electric storms, extremely hot summer weather, and seismic events.

4.8.1 Extreme Winter Conditions

During construction, working through the winter period is planned and the Project location typically experiences relatively cold conditions (see Section 3.4.1). Mean minimum daily temperatures reach their lowest levels in January (-9.5ºC). Extreme cold conditions could result in health and safety risks to the labour force (i.e., frost bite, hypothermia, etc) and could cause equipment inefficiencies or breakdowns. Contractors and workers to be employed for this project will be predominantly from

the regional area and therefore, are accustomed to working under these conditions. The contractor will be required to provide and implement health and safety measures that will protect the workers from extreme weather conditions including providing recommendations for appropriate clothing.

4.8.2 Icing Conditions

Ice storms, could affect on-site construction activities and workers. Impacts could include loss of power to the site, unsafe working conditions and damaged/inoperable equipment and structural failure (e.g., distribution lines). Ice storms of the severity of those experienced in 1998 are a relatively rare event, but storms of less severity may still have the potential to impact working conditions. The contractor will be required to develop and implement health and safety measures to be employed during icing conditions.

During operation, liquid precipitation, hail, humidity level, or snowfall will not affect the turbines. The turbine is designed to shut down when it detects the presence of freezing precipitation and icing to avoid damaging the equipment or creating a hazard to ground personnel. Snowfall levels are not expected to prevent access to the turbines or to create significant amounts of downtime.

4.8.3 Extreme Winds

The rotor will stop moving when 10-minute average wind speeds exceed 25 m/s to avoid damage to the equipment. The foundations will also be designed to resist the forces generated by hurricane force winds.

4.8.4 Electric Storms

During operation, no person shall be allowed in or near a wind turbine during a thunderstorm; restrictive signage will be posted on site. Should a turbine be struck by lightning, an automatic stop will occur to minimize damage to WTG components. The proposed turbines are also equipped with lightning protection and grounding to protect personnel and to avoid damage to the nacelle systems or power grid components. The turbines will be equipped with lightning strike sensors to determine the number of strikes and whether it is necessary to send out an inspector prior to the turbines being placed back in service.

4.8.5 Extreme Summer Conditions

Extremely hot summer conditions may also pose health and safety risks to the labour force (e.g., sunburns, sun stroke, heat exhaustion and dehydration). Drought would not have a negative impact on construction. To mitigate the negative effects of hot conditions on the workers, the contractor will be required to develop and implement health and safety measures that will protect the workers during these extreme summer conditions.

4.8.6 Seismic Events

As discussed in Section 3.1.5, there have been no major seismic events in the vicinity of the Project location. WTGs are designed to resist moderate earthquakes without significant damage, and major earthquakes without collapse. This is considered to be effective protection against the potential seismic activity in the area.

5 Environmental Monitoring Programs

5. Environmental Monitoring Programs

Environmental monitoring is proposed before, during and after project development activities take place. Monitoring programs have been developed for the following three phases of the Project:

- pre-construction period
- construction period
- post-construction operational period.

Preconstruction monitoring ensures that all environmental commitments required prior to construction have been met. Construction monitoring ensures that the construction activities proposed are undertaken in an environmentally responsible manner in accordance with the EA report, contractor specifications and terms and conditions of permits and approval. Operational monitoring is used to verify predictions of effect and to confirm the effectiveness of mitigation measures.

5.1 Pre-Construction Phase

Preconstruction monitoring during this phase involve ensuring that the requisite approvals and permits are procured by the appropriate parties and proper procedures such as emergency and safety plans are documented and in place. Table 5.1 lists the activities which are included in the pre-construction monitoring phase.

Table 5.1 Anticipated Pre-Construction Monitoring

Item	Description
Environmental Permits and Approvals	Ensure requisite permits and approvals are obtained (see list in Section 7)
Tender Specifications	Incorporate all Contractor obligations as per the EA document, conditions of permits and approvals and other technical requirements
Contractor Obligations	Ensure obligations in the tender are met prior to start of construction
Ministry of Labour Notice of Project	Ensure that Contractor(s) has submitted a "Notice of Project" to the Ministry of Labour
Historic/Archaeological Sites	Stage 2 archaeological assessment prior to construction, if required
Photographic record	Prepare photographic record of existing environment prior to construction
Erosion and Sediment Control Plan	To be prepared prior to the commencement of site works and available for review by LTVCA
Spill Response and Clean-up Plan	To be prepared prior to the commencement of site works
Emergency Response Plan	To be prepared prior to the commencement of site works
Vegetation survey of proposed access road locations (if required)	To be undertaken by trained biologist prior to the commencement of site works if it is determined that access roads will be placed through natural vegetation communities
Species at Risk (American Badger, Eastern Fox Snake, Eastern Milksnake) survey of proposed locations of project components, including access roads	To be undertaken by trained biologist prior to the commencement of site works. Assessment of potential habitat for this species will be conducted. Protocol for this work will be determined in consultation with EC/MNR.
Flagging of work area boundaries	To be undertaken with direction from project biologist and/or LTVCA/MNR staff prior to the commencement of site works if work is required within natural areas

5.2 Construction Phase

Monitoring during construction serves to assess compliance with this EA, the contractor specifications and environmental permit/approval conditions. Construction monitoring also provides information which may prompt changes in the manner in which some construction tasks are undertaken. Tasks such as ensuring the proper disposal of waste and adherence to prepared safety and emergency plans are part of construction monitoring.

Table 5.2 (at the end of this section) lists the activities which are included in the construction phase monitoring.

5.3 Post-Construction (Operational) Phase

Post-construction monitoring occurs after all the infrastructure is in place and the facilities are operational. Information obtained from this phase of monitoring serves to verify predicted operational impacts and also serves to evaluate the effectiveness of implemented mitigation measures. Table 5.3 (also found at the end of this section) summarizes proposed post-construction monitoring. Given that the greatest potential impacts as a result of the Project are to birds and bats, a separate post-construction monitoring plan has been prepared and approved by MNR. This post-construction monitoring plan is provided in Appendix I of this report.

Environmental Component	Parameter	Sub-Parameter	Performance Objective	Monitoring Methodology	Monitoring Frequency	Monitoring Timing	Contingency Plan	Reporting
General Environmental Protection Monitoring								
General Environmental Protection	Compliance with Plans	Compliance with approved drawings, protocols, tender, EA and permit and approval specifications	Ensure Project is being constructed in compliance with the aforementioned items.	Owner's Construction Supervisor and Environmental Inspector will review all site activities on a weekly basis to ensure that the contractor is in compliance with requirements	Once per week	Throughout duration of construction period	If contractor is not in compliance, actions will be taken by the owner/owner's representative and contractor as necessary to ensure actions are compliant with environmental requirements	Results of this monitoring will be documented in a weekly environmental inspection report
	Spill Prevention and Response	Training	Ensure all employees and contractors trained in spill prevention and response	A record of training will be maintained to document training received by employees and contractors – training log to be reviewed by the environmental inspector	Reviewed periodically, particularly when new contractors or employees commence activity at the site	Throughout duration of construction	If employees/contractors are working on site without having received proper training in spill response and reporting protocols, they will be instructed to stop work until such time as they have been trained	Monitoring will be reported in weekly environmental inspection report
		Refuelling and maintenance areas	Ensure all refueling and maintenance occurs in designated areas	Refueling and maintenance practices will be informally monitored by construction supervisor and environmental inspector	Informally, as required	Throughout duration of construction	If improper refueling or maintenance practices are observed, the contractor will be instructed to adhere to established protocols – monitoring by construction supervisor and environmental inspector to become more frequent following an incident of non-compliance	Monitoring observations and recommended actions will be documented in the weekly environmental inspection report
		Hazardous materials storage	Ensure all hazardous materials stored in designated locations	Construction area will be visually assessed to ensure all hazardous materials are stored in designated storage locations	Once per week	Throughout duration of construction period when hazardous materials are used on site	If hazardous materials are being stored outside designated areas, the contractor will be instructed to properly store materials. Follow up monitoring conducted as necessary to ensure actions completed to satisfaction of engineer.	Hazardous material storage monitoring will be documented in the weekly environmental inspection report
		Monitoring integrity of secondary containment around storage areas	Ensure containment area is functioning as designed	Visual inspection of containment areas to assess integrity	Once per week	Throughout period that containment areas are in use	If in the opinion of a professional engineer, the containment areas are not sufficient, remedial action will be initiated to ensure adequacy. Follow up monitoring conducted as necessary to ensure actions completed to satisfaction of engineer.	Containment area monitoring will be documented in the weekly environmental inspection report
		Monitor equipment containing fluids	Prevent leaks	Visually monitor equipment to ensure it is not leaking or prone to leaking fluids	Once per week	Throughout the duration of construction	If leaks are observed, the piece of equipment will be shut off and removed from sensitive areas until such time as the leak is repaired	Equipment monitoring will be documented in the weekly environmental inspection report
		Monitor work area for signs of contamination	Minimize extent of contamination should it occur	Work area will be monitored for signs of contamination (e.g., fluid stains, dead or stressed vegetation) prior to site remediation	Once	Following completion of construction, prior to site restoration	If contamination is observed, the contaminated soil will be removed and disposed of as per provincial and federal regulations	Monitoring will be documented in the weekly environmental inspection report
Natural Environment Monitoring								
Soil	Sediment and erosion control measures	Adequacy in preventing erosion and sedimentation	Ensure releases of sediment and erosion from Project location are controlled.	All construction areas will be visually assessed by a designated environmental inspector to determine the adequacy of the sediment and erosion control	Once per week and after every rainfall event	Throughout the duration of the construction period	Requirement for remedial action will be at the discretion of the environmental inspector	Sediment and erosion control measure adequacy will be reported in a weekly environmental inspection report

Environmental Component	Parameter	Sub-Parameter	Performance Objective	Monitoring Methodology	Monitoring Frequency	Monitoring Timing	Contingency Plan	Reporting
				measures				
		Silt Fences	Ensure silt fences are installed correctly and functioning appropriately	Visual inspection of all silt fences to ensure they are properly constructed and to assess sediment accumulation behind the fence	All silt fences will be inspected once per week and after every rainfall	Monitoring will occur as long as the silt fences remain in place	Silt fences must be repaired immediately if they are found to have failed Sediment must be removed if it accumulates to half the height of the geotextile material	Silt fence status will be reported on a weekly basis in the environmental inspection report
		Stockpiles	Prevent development of anaerobic conditions within, and erosion from, stockpiles	Visual inspection of all soil stockpiles to measure height of stockpiles, and ensure that if stockpiles are in place for >30 days, that they are protected from erosion	Once per week	Throughout the duration the stockpile is in place	If stockpiles have remained in place for >30 days, they will be seeded with a quick growing native grass If stockpiles are >1 m in height, opportunities for lateral spreading will be examined	Stockpile status will be reported in a weekly environmental inspection report
		Check dams (if required)	Ensure check dams are installed correctly and functioning appropriately	Visual monitoring to ensure check dam integrity, assess functionality and measure sediment accumulation	Once per week and after every rainfall and significant snowmelt	Throughout the duration the check dam is in place (if temporary)	Remedial action will be initiated if it is observed that rocks have been redistributed in a manner that would affect the functionality and/or if erosion (e.g., bank slumping, down cutting of the channel) is observed Sediment should be removed from the upside side of the check dam when accumulation becomes visible	Check dam status will be reported in a weekly environmental inspection report
		Limit of work flagging/restriction devices (if required)	Ensure construction is not occurring beyond extent of work areas	Limit of work devices will be inspected around the construction site to ensure they are in place and that the contractor is adhering to them	Once per week	Throughout the duration of the construction period	Construction site boundaries will be flagged or other restriction devices installed if they are found to not be in place Importance of adherence to limit of work boundaries will be reinforced with contractor if they are not being adhered to	Limit of work boundary status will be reported in a weekly environmental inspection report
	Revegetation (if required)	Adequacy of revegetation in natural areas	Ensure revegetation levels are meeting targets established with MNR/LTVCA	Revegetation areas will be visually monitored to determine the adequacy of vegetation growth in preventing/minimizing erosion	Three times per year (spring, summer and fall)	3 years following initial revegetation – provided adequate vegetation is achieved by at least the final year of monitoring	If adequate vegetation is not observed in the disturbed areas prior to the end of the first growing season, other erosion protection measures will be implemented to ensure the area will remain stable over the winter and early spring. Levels of adequate vegetation to be established in association with LTVCA/MNR.	Vegetation monitoring conducted during the construction period will be documented in the weekly environmental inspection reports Vegetation monitoring conducted during the operational period will be documented in the annual monitoring reports (see Table 11.3)
	Soil Compaction	Compaction in areas for re-use as agricultural lands and /or	Minimize extent of soil compaction	Areas designated for re-use as agricultural lands and/or revegetation will be visually	Once	Immediately prior to site restoration	If compaction with the potential to inhibit vegetation growth is present, remedial action will be implemented	Compaction monitoring will be reported in the weekly environmental

Environmental Component	Parameter	Sub-Parameter	Performance Objective	Monitoring Methodology	Monitoring Frequency	Monitoring Timing	Contingency Plan	Reporting
		revegetation		monitored for signs of compaction (i.e., rutting, surface flattening) prior to site restoration				inspection report
Air Quality	Fugitive dust	Fugitive dust generation	Minimize fugitive dust generation	Dust will be visually monitored to assess if excessively dusty conditions are present	No specific monitoring frequency – continuous monitoring by the environmental inspector and construction supervisors	Throughout the duration of the construction period	Visible dust plumes in the construction area will trigger a formal review by the environmental inspector to determine appropriate mitigation measures to minimize dust	Dust conditions will be reported in the weekly environmental inspection report
Surface Water	Flow rates	Amount of flow pumped from excavations	Ensure any water takings, if required, comply with MOE regulations.	Amount of flow will be calculated based on the flow rate of the pumping equipment and the amount of time the pump is operated	Continually, during pump operation	Throughout the duration of pumping activities	If there is a PTTW in place to authorize pumping in excess of 50,000 L/d, no remedial action is required If no PTTW is in place and a daily volume of 40,000 L/d recorded, a PTTW application will be submitted to MOE to ensure that taking is authorized in the event the taking exceeds 50,000 L/d	Water takings will be documented in the annual PTTW report to the MOE. Record of monitoring will be documented daily in the water taking log.
Terrestrial Vegetation	General Construction Monitoring	Limit of work flagging/restriction devices (if required)	Ensure construction is not occurring beyond extent of work areas	Limit of work devices will be inspected around the construction site to ensure they are in place and that the contractor is adhering to them	Once per week	Throughout the duration of the construction period	Construction site boundaries will be flagged or other restriction devices installed if they are found to not be in place Importance of adherence to limit of work boundaries will be reinforced with contractor if they are not being adhered to	Limit of work boundary status will be reported in a weekly environmental inspection report
	Revegetation (if required)	Monitor site revegetation to ensure approved restoration protocol (to be developed if required) is followed	Ensure revegetation levels are meeting targets established with MNR/LTVCA	Environmental inspector and construction supervisor will monitor the activities of the contractor to ensure that site restoration protocol is adhered to	Continually during site restoration	Throughout the duration of the site restoration period	If activities are occurring during site restoration that is not approved within the site restoration protocol, these activities are to be ceased.	Monitoring will be reported in the weekly environmental inspection report
Wildlife	General Construction Monitoring	Monitor potentially destructive activities (such as construction of access roads, trenching, excavation for turbine foundation, etc.) and blasting activities (if required) to ensure that none of these activities are occurring within the restriction windows	Ensure restriction windows are being adhered to by construction contractor.	Environmental inspector and construction supervisor will monitor the activities of the contractor to ensure that restriction windows are followed.	Continually	Throughout the duration of the restriction window	If potentially destructive activities or blasting is to occur within the restriction window, areas to be disturbed or within 100 m of blast sites are to be surveyed by a biologist to determine if bird nesting, bat maternity colonies, denning, or breeding evidence of other species occurs in the area. If any of these activities are found to be present, work should either be delayed until the site is no longer in use, or a mitigation plan is developed in consultation with EC/MNR that may include an alternate route around the feature (>100 m away) or other suitable mitigation.	Monitoring will be reported in the weekly environmental inspection report

Environmental Component	Parameter	Sub-Parameter	Performance Objective	Monitoring Methodology	Monitoring Frequency	Monitoring Timing	Contingency Plan	Reporting
	General Construction Monitoring	Monitor work areas/machinery for presence of wildlife	Reduce potential for wildlife interactions.	All work areas and construction machinery to be searched for wildlife prior to start of work	Daily	Throughout the duration of the construction period	Any wildlife observed will be managed in accordance with protocols for wildlife encounters to be developed with MNR.	Interactions with wildlife will be reported in the weekly environmental inspection report
	General Construction Monitoring	Monitor site cleanliness to avoid wildlife attraction	Reduce potential for wildlife attraction to the construction area.	Environmental inspector and construction supervisor will monitor site cleanliness.	Continually	Throughout the duration of the construction period	If site cleanliness is determined to be an issue, the environmental inspector and/or the construction supervisor are to reinforce this issue with the contractor.	Site cleanliness will be reported in the weekly environmental inspection report

Environmental Component	Parameter	Sub-Parameter	Performance Objectives	Monitoring Methodology	Monitoring Frequency and Timing	Anticipated Data Product	Contingency Plan	Reporting
Natural Environment Monitoring								
General Environmental Protection Monitoring	Spill Prevention and Response	Employee and Contractor Training	Ensure all employees and contractors trained in spill prevention and response	A record of training will be maintained to document training received by employees and contractors – training log to be maintained on site	As required any time new employees or contractors are working on site	Confirmation that all new staff and contractors have been trained in procedures	If contractors and staff have not been trained, they must stop work until receiving adequate training	Training log will be updated as required
		Refueling and Maintenance Activities	Ensure all refueling and maintenance occurs in designated areas	Refueling and maintenance practices will be informally monitored by site operator to ensure required mitigation being implemented	As required, informally	Implemented procedures compared to written procedures to verify compliance	If procedures are not being adhered to, site operator must alter his activities	Informal reporting in site operator's log
		Monitor equipment containing fluids	Prevent equipment leaks	Visually monitor equipment to ensure it is not leaking or prone to leaking fluids Oil accumulation in the oil-water separator will be monitored as per the suppliers recommendations	Monthly, as part of operators normal site monitoring As per suppliers recommendations	Verification that all equipment leak free Oil accumulation levels to determine when clean out required	If leaks are observed, site operator will initiate repairs to ensure no leaks are occurring Clean out initiated as per supplier's recommendations	Monitoring and actions reported in operator's log Monitoring reported on oil-water separator log book
Soils / Terrestrial Vegetation	Erosion and sediment control Revegetation (if required)	Adequacy of revegetation efforts (if required)	Ensure revegetation levels are meeting targets established with MNR/LTVCA	Sites that have been revegetated (if required) will be visually monitored to determine adequacy of vegetation growth in preventing/minimizing erosion.	Three times per year (spring, summer and fall) in Years 1, 2 and 3 following site restoration efforts	Documented statues of revegetated sites	If adequate vegetation is not observed in the disturbed areas prior to the end of the first growing season, other erosion protection measures will be implemented to ensure the area will remain stable over the winter and early spring. Levels of adequate vegetation to be established in association with LTVCA/MNR	Revegetation success will be reported in the annual Operational Monitoring Report.
Terrestrial Wildlife	Bird and Bat Mortality	Monitor mortality rates of bird and bat populations	Ensure bird and bat mortality levels remain below thresholds outlined in Appendix J	Monitoring to be conducted according to provincial and federal guidelines.	See Appendix J for details of monitoring methodology, monitoring frequency and timing, anticipated data products, triggers for action, and reporting.			
Socioeconomic Environment Monitoring								
Ambient Sound Levels	Noise Emissions	Changes to ambient sound levels during Project operation	Ensure Project meets MOE sound level requirements	Ambient sound levels are to be monitored as required by the Renewable Energy Approval (REA) under the *Environmental Protection Act*	Monitoring will occur as per the requirements of the REA.	Ambient sound level measurements	If sound level measurements are in excess of allowable limits, as identified in the REA, Saturn Power will be advised to address the problem. Retesting will occur as necessary to ensure emissions meet stated limits.	The data will be reported as per the requirements of the REA.

6 Environmental Approval and Permits

6. Environmental Approvals and Permits

In addition to the overall project approvals and environmental screening requirements for the Project noted above, there are other environmental permits and approvals that will be required prior to developing the site, listed by agency in Table 6.1.

Table 6.1 Primary Environmental Permits/Approvals

Approval Requirement	Agencies Involved
Federal	
Aeronautical Obstruction Clearance (Tower Lighting)	Transport Canada
Land Use Proposal – Aviation safety	NAV Canada
Temporary Magazine License (Explosives)	NRCan
Permit under Migratory Birds Convention Act to collect dead bird carcasses	Canadian Wildlife Service
Aviation Safety Review of Guyed MET Towers	NAV Canada
Provincial	
Renewable Energy Approval	MOE – O. Reg. 359/09
Section 80, OEB Prohibition, Transmission or Distribution by Generators	Ontario Energy Board
Section 92, OEB Leave to Construct	Ontario Energy Board
Generator's License	Ontario Energy Board
Approval for Road Encroachment (Transmission Lines)	MTO
Stage II Archaeological Assessment	Ministry of Culture
Finalized Connection Agreement	IESO (Independent Electricity System Operator)
Facility Registration	IESO (Independent Electricity System Operator)
Meter Registration	IESO (Independent Electricity System Operator)
Customer Impact Assessment (CIA) to determine the impact of new generation connection on existing transmission customers.	Hydro One Networks Inc. (HONI)
Joint Use Agreement for overhead lines	HONI
Notice of Project (contractor)	Ministry of Labour
Waste Generator Licence (contractor)	MOE
Meter approval	HONI
Municipal	
Building Permits	Local Municipality
Entrance Construction Permit(s)	Local Municipality
Letter of Conformity for Wind Turbine Generators	Local Municipality
Waste Disposal Approval	Local Municipality
Half load permit approval (for hauling on local roads)	Local Municipality
Permit to Construct or Demolish (holding tanks for work trailers)	Local Municipality
Easement agreements of overhead or underground lines	Local Municipality

7 Conclusions and Recommendations

7. Conclusions and Recommendations

7.1 Screening Conclusion

The results of the provincial environmental assessment are that the Project will not cause significant adverse environmental effects after mitigation measures are applied.

7.2 Mitigation, Monitoring and Permitting Recommendations

The mitigation recommendations contained in this document will become part of the Contractor's obligations for this project as applicable.

Saturn Power will appoint an environmental inspector at the Project location to ensure implementation of the preconstruction and construction monitoring programs. Saturn Power and its environmental consultant will be responsible for the post-construction monitoring program.

Saturn Power should also assign a permitting team to the Project whose role is to ensure that all necessary permits for the Project are in place prior to construction.

7.3 Application for Renewable Energy Approval

As this environmental assessment is now complete, it is submitted to MOE for a decision with respect to the issuance of a Renewable Energy Approval for the Project.

8 References

8. References

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