Appendix C7

Physical, Atmospheric and Natural Environment Report

PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

WOLFE ISLAND WIND PROJECT

TECHNICAL APPENDIX C7

File No. 160960180

Prepared for:

Canadian Renewable Energy Corporation
a wholly owned subsidiary of
Canadian Hydro Developers, Inc.
c/o 500 -1324 17th Avenue SW
Calgary AB, T2T 5S8

Prepared by:

Stantec Consulting Ltd.
361 Southgate Drive
Guelph ON N1G 3M5

November 2007

TECHNICAL APPENDIX C7
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

Table of Contents

1.0 INTRODUCTION 1.1

2.0 PHYSICAL ENVIRONMENT 1.1
2.1 PHYSIOGRAPHY AND TOPOGRAPHY 2.1
2.2 SOILS 2.1
2.3 GEOLOGY 2.2
2.4 SEISMICITY 2.2
2.5 GROUNDWATER 2.3
2.5.1 Wolfe Island 2.3
2.5.2 Kingston Mainland 2.4
2.6 SURFACE WATER HYDROLOGY AND WATER QUALITY 2.4
2.6.1 Wolfe Island 2.4
2.6.1.1 Hydrology 2.4
2.6.1.2 Water Quality 2.6
2.6.2 Kingston Mainland 2.6
2.6.2.1 Hydrology 2.6
2.6.2.2 Water Quality 2.7

3.0 ATMOSPHERIC ENVIRONMENT 2.1
3.1 CLIMATE 3.1
3.2 AIR QUALITY 3.1

4.0 NATURAL ENVIRONMENT 3.1
4.1 WETLANDS 4.1
4.1.1 Wolfe Island Wetlands 4.1
4.1.2 Kingston Mainland Wetlands 4.3
4.2 VEGETATION COMMUNITIES 4.4
4.3 WILDLIFE 4.6
4.3.1 Terrestrial Wildlife 4.6
4.3.2 Wetland Wildlife 4.7
4.3.3 Aquatic Habitats 4.8
4.4 WILDLIFE CORRIDOR AND HEDGEROW STUDY 4.9
4.4.1 Definition of Terms 4.10
4.4.2 Identification of Corridors 4.10
4.4.3 Plant and Wildlife Usage of Corridors 4.11
4.4.3.1 Species Groups That Do Not Use Corridors 4.11
4.4.3.2 Species Groups That May Use Corridors 4.12
4.4.3.3 Species Groups That Usually Use Corridors 4.13
4.4.4 Field Investigations: Approach 4.14
4.4.5 Field Investigations: Findings 4.14
4.4.6 Conclusions 4.15

TECHNICAL APPENDIX C7
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

Table of Contents

4.5 SIGNIFICANT SPECIES....4.15
4.5.1 Plant Species at Risk....4.17
4.5.2 Bird Species at Risk....4.17
4.5.3 Mammal Species at Risk....4.18
4.5.4 Reptile and Amphibian Species at Risk....4.18
4.5.5 Fish Species at Risk....4.19

5.0 CONCLUSIONS....5.1
5.1 WOLFE ISLAND....5.1
5.2 KINGSTON MAINLAND....5.1

6.0 LITERATURE CITED....5.1

List of Appendices

Appendix A Figures
Appendix B Tables
Appendix C NHIC Database Records

List of Figures

Appendix A

Figure 1.1 Project Location and Study Area
Figure 2.1 Soil Classifications, Water Well Locations, and Natural Drainage Features
Figure 4.1 Natural Environment Features
Figure 4.2 Vegetation Communities: Kingston Mainland
Figure 4.3 Vegetation Communities: Wolfe Island, Northwest Key Portions of Study Area
Figure 4.4 Vegetation Communities: Wolfe Island, North Central Key Portions of Study Area
Figure 4.5 Vegetation Communities: Wolfe Island
Figure 4.6 Wolfe Island Hedgerows and Wildlife Utility Areas

TECHNICAL APPENDIX C7
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

Table of Contents

List of Tables

Appendix B

Table 2.1 Spectral Hazard Values for the Kingston Area (NRCan, 2003)
Table 3.1 2005 Air Quality Index Summary
Table 4.1 ELC Vegetation Community Descriptions
Table 4.2 Hedgerow Assessment
Table 4.3 Rare Species
Table 4.4 Transmission Line Butternut Health Assessment

TECHNICAL APPENDIX C7
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

Table of Contents

This page left blank intentionally.

1.0 Introduction

Canadian Hydro Developers, Inc., through its wholly owned subsidiary Canadian Renewable Energy Corporation ("CREC"), is proposing to develop a 197.8 megawatt ("MW") wind plant on Wolfe Island, Township of Frontenac Islands, Frontenac County, Province of Ontario (the "Project"). Eighty-six, 2.3 MW wind turbine generators will be placed strategically over the western portion of Wolfe Island.

Electricity from the Project will be gathered via a 34.5 kilo volt ("kV") collection system, converted to 230 kV at a transformer station on Wolfe Island, and then transmitted via a new electrical transmission line that will run underwater through a portion of the St. Lawrence River, known locally as the "Lower Gap". Upon reaching the mainland, the transmission line will be underground, connecting with the provincial grid at Hydro One Network Inc.'s Gardiners Transformer Station in the City of Kingston. The study area for the Project is shown in **Figure 1.1 (Appendix A).**

As part of the Ministry of the Environment's Environmental Screening Process ("ESP") for electricity projects (i.e., Ontario Regulation 116/01), Stantec Consulting Ltd. ("Stantec") undertook a study of the natural environment features and functions of the study area in order to establish baseline environmental conditions prior to Project implementation. This study included a review of background information including previous environmental studies and available literature relevant to the study area. Data collected during previous surveys in the study area, including baseline information collected by Acres International (2005), and information provided by government agencies, were examined and supplemented with data collected during site-specific field surveys.

Targeted wildlife field studies were conducted for specific groups of species, and the results are presented in separate technical appendices: **Technical Appendices C2, C5, C8 and C9** contain information on amphibians, birds, butterflies and bats, respectively. This Physical, Atmospheric and Natural Environment Baseline Report is intended to characterize the environmental setting of the study area, documenting the components of the physical and natural environments that are not covered in other technical appendices.

This Technical Appendix, in part, also presents information relevant to items 4.1, 4.4, and 4.6 of the Ministry of the Environment's ("MOE") environmental screening checklist. Specifically, will the project:

- cause negative effects on rare, threatened or endangered species of flora or fauna or their habitat?
- have negative effects on wildlife habitat, populations, corridors or movement?
- have negative effects on migratory birds, including effects on their habitat or staging areas?

This page left blank intentionally.

2.0 Physical Environment

2.1 PHYSIOGRAPHY AND TOPOGRAPHY

The study area lies within the Napanee Plain physiographic region (Chapman and Putnam, 1984). This region is characterized by flat to undulating limestone plains from which the retreating glacier stripped most of the overburden. In the south of this region, depressions are often filled with deposits of stratified clay. These clay deposits, with smaller areas of limestone plain, dominate Wolfe and Simcoe Islands and the Kingston area mainland.

The clay plains that cover all of Wolfe and Simcoe Islands have little relief. Wolfe Island rises to its highest elevation of 104 m above sea level ("asl") from the surrounding lake level of approximately 75 m asl. A ridge extends along the southwestern portion of Wolfe Island, known locally as "The Ridge", with elevations reaching slightly above 90 m asl. Simcoe Island reaches an elevation of just over 80 m asl. The Kingston mainland area gently slopes upwards from the St. Lawrence River to an elevation of roughly 90 m asl in the northern portion of the study area.

A more detailed discussion of physiography in the study area is provided in **Technical Appendix C10 – Submarine Cable Crossing Report**.

2.2 SOILS

The soils of the study area are shown on **Figure 2.1 (Appendix A)**. The major soil types on Wolfe Island and in the Kingston area are Lansdowne clay and Napanee clay (Gillespie et.al., 1966). Lansdowne clays are generally found on gently sloping portions of the underlying limestone plains, creating an imperfectly drained soil. This soil is described as having moderate limitations for agriculture related to undesirable soil structure and/or permeability (Class 2d), in the Canada Land Inventory ("CLI") capability for agriculture mapping (ARDA, 1964).

Napanee clays are found in depressional areas of the limestone plain and are therefore poorly drained. CLI mapping of this soil indicates that this soil has moderately severe limitations for agriculture related to excess water (Class 3w).

Pockets of Farmington loam (Class 6r), Lindsay clay (Class 2w), and Newburgh silt loam (Class 2t) are dispersed throughout the Wolfe Island study area. Big Sandy Bay wetland is dominated by peat except for the shoreline area, which is predominantly Eastport sand. Soils in the other wetlands in the Wolfe Island study area have not been classified.

Lansdowne and Napanee clay types also dominate the mainland portion of the study area, although Muck is prevalent along the margins of the Little Cataraqui Creek and associated wetland area. Small pockets of Farmington loam are located within the mainland study area,

west of the Little Cataraqui Creek (Gillespie et al, 1966). Other portions of the mainland study area are underlain by Napanee shallow-phase clays.

A more detailed description of soils and CLI capability of soils in the study area is provided in **Technical Appendix C1 – Agricultural Assessment and Profile Report**.

2.3 GEOLOGY

The bedrock underlying the study area consists of the Middle Ordovician (472 to 461 million years old) Trenton and Black River Groups consisting of carbonate rock, i.e., limestone, minor dolostone and shale (Freeman, 1978). A thin layer of Pleistocene era glaciolacustrine deposits of silt and clay are present over much of the study area (Barnett, 1992).

Bedrock outcroppings are also present in the shoreline areas of the Kingston mainland and Wolfe Island. Outcroppings can also be observed throughout Wolfe Island and it is likely that depth to bedrock on the island may be within three metres in many locations.

A geological field investigation was undertaken by CREC in April 2004 to provide a basic understanding of the geology on Wolfe Island. The investigation involved ten boreholes drilled to a depth of up to 7.72 m below ground level. Key findings from these investigations indicated:

- overburden exists over a large extent of the western half of Wolfe Island that consists of firm glaciolacustrine varved clays. The maximum observed thickness of overburden was 6.26 m, but generally thickness ranged from 0.9 to 3.5 m;
- bedrock geology consists of limestone and interbedded limestone and shale. The limestone beds are consistently very strong, while the shale beds tend to be weak; and,
- structurally, the bedded sedimentary formations dip two to three degrees southeasterly with the younger rocks found to the southeast.

2.4 SEISMICITY

The study area for the Project lies in a zone of mild potential (Zone 1) for seismic activity (ACNBC, 1980). Unlike the traditional earthquake-prone zones along plate margins, (e.g., those known in the western Rocky Mountains), seismic activity in the study area is related to slippage along ancient fault lines located within the North American continental plate. Earthquake prediction in the study area is difficult, as few ancient faults have been identified.

Natural Resources Canada (“NRCan”) maintains a broad-band seismograph station in the City of Kingston, which monitors seismic activity of the City and surrounding area. According to NRCan (2003) Kingston lies in the southern Great Lakes seismic region, which has a low to moderate level of seismicity when compared to more active areas to the east including the Ottawa River and Quebec.

According to the Ontario Building Code, which was revised and released in 2005 (MMAH, 2005), seismic activity in the Kingston area is relatively low. Peak and spectral hazard values are determined for an exceedence of 2% per 50 years. Peak Ground Acceleration is a measure of earthquake acceleration, which measures how hard the ground shakes in a given geographic area. For the Kingston area, the Peak Ground Acceleration is approximately 0.16 m/s^2 (NRCan, 2003). Spectral hazard values by spectral period are listed in **Table 2.1 (Appendix B)**.

2.5 GROUNDWATER

2.5.1 Wolfe Island

A comprehensive groundwater investigation has not been completed for Wolfe Island (Cataraqui Region Conservation Authority ["CRCA"], pers. comm.). A geological field investigation, undertaken by CREC in April 2004, was completed to gain an understanding of the geologic conditions within the study area and provided an opportunity to investigate local groundwater conditions.

Groundwater levels were monitored on Wolfe Island during the April 2004 drilling program and water levels were measured in wells used by landowners for livestock watering. In all cases water was measured within 0.3 to 0.5 m of the ground surface. It was determined that the upper 1 to 2 m of bedrock is water bearing and artesian. The bedrock surface is capped with clay which confines the water. Discussions with local landowners revealed that the numerous farm ponds in the area are excavated to bedrock and they contain surface water year-round.

Site-specific geotechnical investigations have been conducted at all 86 turbine sites. Boreholes were drilled at 16 random sites, with groundwater information collected at each borehole during this investigation. At the each of the16 boreholes small diameter (37 mm) twinned standpipes were installed.

One standpipe was installed in the overburden and sealed at the surface and the other was installed into the bedrock and sealed at bedrock and ground surface. Water levels were recorded on December 6th, 2006, and on August 17th, 2007. Watertable depth at most of the overburden and bedrock monitoring well locations were 1.0 to 2.0m below the existing ground surface.

A review of water well records for the Wolfe Island study area indicated the presence of 275 wells (MOE, 2006). Locations of these wells are shown on **Figure 2.1 (Appendix A)**. Mean depth to water is approximately 17 m, with a minimum depth of 1.5 m and maximum depth of 99.7 m. Of these wells, 122 are used for domestic water, 35 are used for livestock, 18 are used for industrial, commercial and public supply, and 100 are not in use.

The Township does not operate any municipal water supplies on Wolfe Island. Residents rely on individual water supplies taken from groundwater sources or the adjacent water body (Clark Consulting Services, 2003).

2.5.2 Kingston Mainland

Old water well records for the Kingston mainland area (Lots 10 and 11, Concessions 1 and 2) indicate that water was found between 6 and 24 m with the static water level being between 2 and 12 m (MOE, 1974). Water was described as fresh with the geology characterized as clay overburden located above limestone bedrock.

A review of water well records for the Kingston mainland study area indicated the presence of 36 wells (MOE, 2006). The location of these wells is shown in **Figure 2.1 (Appendix A)**. Mean depth to water is approximately 18 m, with a minimum depth of 6.7 m and maximum depth of 51.8 m. The majority of the wells (28 out of the 36) are used for domestic water. One well is used for livestock and four wells are used for commercial purposes. Three of the wells are not in use.

2.6 SURFACE WATER HYDROLOGY AND WATER QUALITY

The discussion of surface water hydrology of the Wolfe Island and Kingston mainland portions of the study area from Acres International (2005) is summarized below, along with general information on water quality. A detailed discussion of the aquatic environment in the Lower Gap portion of the study area, including water quality data is provided in **Technical Appendix C10 – Submarine Cable Crossing Report**.

2.6.1 Wolfe Island

2.6.1.1 Hydrology

The Wolfe Island portion of the study area is drained by a number of watercourses and a network of grassy swales. All watercourses on Wolfe and Simcoe Islands drain into Lake Ontario/St. Lawrence River. The five primary watercourses in the Wolfe Island study area include Reeds Creek, Shanty Creek, Bueters Creek, an unnamed creek flowing into Reeds Bay, and an unnamed watercourse flowing into Sand Bay. As shown on **Figure 2.1 (Appendix A)**, all of these watercourses and their larger tributaries have been classified as warmwater streams by the MNR (2006). Reaches of many watercourses on the island appear to have been historically realigned.

Generally, these watercourses originate in depressional areas in agricultural fields and woodlots. Flow in their upper reaches is intermittent and largely dependent on surface runoff during and after storm events and throughout the spring thaw. Portions of some mid and lower reaches of these watercourses, with more deeply incised channels, likely receive some groundwater input, especially during elevated groundwater table conditions in the spring. Surface flow is also periodically supplemented with water conveyed through a series of first order grassy swales that traverse agricultural lands. Gentle local topographic relief results in low channel gradients with flow morphology generally characterized as a series of long runs and flats, interspersed by short shallow riffles in higher gradient areas with still pools prevalent in lower reaches. Despite the likelihood of groundwater contribution, the low channel gradients and

associated low current velocities and general lack of overhead riparian cover result in direct sunlight exposure, and consequently elevated summertime water temperatures. The groundwater input, however, does result in permanent baseflow in some lower reaches, albeit minimal during hot summer months.

The primary watercourses draining the study area have extreme flow regimes, with periods of high flows confined to runoff events and the spring freshet. During years of average precipitation, flow rates slowly decrease into the early summer. A description of each of the primary watercourses found within the study area on Wolfe Island is provided below.

Reeds Creek, which originates around 8th Line north of Reeds Bay Road, has a well defined channel with substrate material consisting of exposed bedrock with scattered cobbles and boulders throughout much of the upper and mid reaches. The stream substrate in depositional areas with slow current velocity, which are common in the lower reaches near its mouth at Reeds Bay, consists primarily of muck. During the spring, surface flow averages approximately one to two metres wide and < 30 cm deep although larger pools approximately four to five metres wide and >30 cm deep are found throughout the lower reaches (i.e., Concession 5, south of baseline ["SBL"] Lot 4). The reach crossing Concession Road 4, approximately 800 m north of Baseline Road has been identified as a municipal drain on the most recent update of the Ministry of Agriculture, Food and Rural Affairs mapping (1998). However, this drain (Reeds Bay Municipal Drain) has not been classified according to the Department of Fisheries and Ocean's ("DFO") *1999 Class Authorization System for Agricultural Drains in the Southern Ontario Region* (DFO, pers. comm.).

Shanty Creek arises in a deciduous swamp (Concession 8, SBL Lot 6) and flows east draining into Bayfield Bay. The channel is predominantly composed of muck, although scattered boulders, cobble, and gravels were evident at several constricted flow locations around 7th and 8th Lines.

Bueters Creek also originates in Concession 8, SBL Lot 6, as a series of small drainage features, although flow is conveyed to the west before draining into Big Sandy Bay.

Surface flow conditions of the unnamed creek flowing into Sand Bay vary considerably and are strongly influenced by runoff events. Spring time observations at the 3rd Line crossing of the creek suggest that the average wetted width nearly doubles following significant rainfall events, indicating the flashy flow character. In general, the channel substrate is comprised of muck in the wider, slower flowing sections, while areas with higher gradient consist of sand and gravel with scattered boulders and cobble. Riparian vegetation is generally limited to terrestrial grasses, which may be temporarily inundated during peak flow events (spring freshet).

The unnamed creek flowing into the north side of Reeds Bay arises just west of 7th Line, south of Baseline Road. Near the mouth of the creek the backwater effect from Lake Ontario likely keeps the creek channel watered throughout the year within Reeds Bay Wetland, while mid and upper reaches are typically dry later in the season.

There is a man-made channel present at the northeastern boundary of the study area. The canal was created in the 1850's to provide a navigable waterway between Barrett Bay and Bayfield Bay, and thereby create an easy trade route between the Kingston mainland and Cape Vincent, New York (Lake Ontario Waterkeeper, 2006). Currently, the canal is densely vegetated with cattails, with some areas of open water.

Ponds, typically constructed for irrigation or hunting (waterfowl attraction) purposes, are found in agricultural areas throughout the study area. Most of the ponds are online features, situated along the main branches of creeks or smaller drainage tributaries. Some ponds have outflows that form the headwaters of tributary swales. The ponds typically appear to be less than one metre deep during the spring, and in-stream vegetation is limited to flooded grasses around the periphery in most cases. Many of the larger ponds appear to have been constructed specifically to attract waterfowl during the fall migration and hunting season as hunting blinds have been erected around their edges. As previously mentioned numerous farm ponds in the area are excavated to bedrock and contain surface water year-round.

2.6.1.2 Water Quality

No surface water quality information is available for any of the watercourses on Wolfe Island (CRCA, pers. comm.; MNR, pers. comm.). However, based on the predominance of agricultural land uses in the study area, combined with visual observations during the field inventories, surface water quality is considered somewhat degraded due to anthropogenic influences. Direct livestock access to the watercourses at numerous locations contributes to impaired water quality through organic enrichment, increased turbidity and bank erosion. Additionally, surface water runoff conveying agricultural products (e.g., fertilizers, pesticides, herbicides) will degrade surface water quality. Periodic high flows resulting from runoff events, combined with the lack of adequate riparian buffers in many locations, further contribute to stream bank and channel bed erosion. Elevated summertime water temperatures, resulting from low channel gradients, slow current and very limited overhead riparian cover, will also encourage low dissolved oxygen levels.

2.6.2 Kingston Mainland

2.6.2.1 Hydrology

Watercourses in the mainland study area are shown on **Figure 2.1 (Appendix A)**. All of the watercourses present are classified as warmwater streams by the Ministry of Natural Resources ("MNR") (2006). In the southern portion of the study area, the Sand Bay and Point Pleasant / Paterson Park area contain three drainage features; one small creek, a drainage ditch, and a storm sewer outfall that all drain into the Lower Gap.

Most of the surface drainage throughout the south/central portion of the mainland study area is conveyed through a small unnamed tributary of the Little Cataraqui Creek that flows from southwest to northeast through the Correctional Service Canada ("CSC") property, before discharging into the Main Branch of Little Cataraqui Creek.

The primary drainage feature in the northern portion of the mainland study area is the West Branch of Little Cataraqui Creek. Upon entering the study area, this permanently flowing watercourse flows northeast through a well-defined, previously straightened channel as it traverses the Ducks Unlimited ("DUC") wetland restoration project on the CSC Frontenac Institution lands. The West Branch then flows under Bath Road, and continues northeast until it converges with the Main Branch of Little Cataraqui Creek approximately 1 km east of the study area. From this confluence, the Main Branch flows southward to its mouth in Cataraqui Bay on the Lower Gap east of Carruthers Point.

2.6.2.2 Water Quality

No surface water quality information is available for any of the watercourses on the Kingston mainland portion of the study area (CRCA, pers. comm.; MNR, pers. comm.). A number of water quality stations have been recently established on both the main and west branches of the Little Cataraqui Creek by the CRCA and the Kingston Field Naturalists as part of ongoing environmental monitoring and aquatic rehabilitation projects. According to the CRCA, no data are presently available from any of the stations (CRCA, pers. comm.).

This page left blank intentionally.

3.0 Atmospheric Environment

3.1 CLIMATE

The study area is located in the climatic region known as the South Slopes of southern Ontario (Brown et al., 1974). Maximum and minimum temperatures in this climatic region are moderated by the proximity to Lake Ontario and Lake Erie. Mean daily temperatures remain above zero degrees Celsius from approximately April through November, resulting in a mean annual growing season of 205 days. This climatic region has a mean of 145 frost-free days per year with an annual mean rainfall of 86 cm and a mean annual snowfall of 203 cm.

Data regarding the local climatic conditions are available from the Kingston Pumping Station meteorological station for the years 1971 through 2000 (Environment Canada, 2004). The mean annual temperature is 7.6°C. Mean monthly precipitation varies between 0.59 cm in July and 0.94 cm in September, with no pronounced wet or dry season. Summer thunderstorm activity is relatively frequent. Average rainfall is 78 cm, and average snowfall is 180 cm.

For more information regarding the climatic conditions in the vicinity of the study area, refer to **Technical Appendix C10 – Submarine Cable Crossing Report**.

3.2 AIR QUALITY

The MOE maintains an air quality monitoring station in Kingston. Air Quality Index (“AQI”) data collected from the Kingston station for the year 2005 is summarized in **Table 3.1 (Appendix B)**. According to information from this station, 82% of the days in 2005 had air quality readings of either Good or Very Good. Poor air quality readings were the result of elevated levels of ozone (O3) and/or fine particulate matter (PM2.5).

This page left blank intentionally.

4.0 Natural Environment

Significant natural features within the study area, as designated by the MNR and the CRCA, are shown on **Figure 4.1 (Appendix A)**. Descriptive records obtained from the MNR Natural Heritage Information Centre (NHIC) database (2007) of each of the significant natural areas within the study area are provided in **Appendix C.** Several areas on Wolfe Island have also been designated as Environmentally Sensitive Areas ("ESA") in the Township of Frontenac Islands Official Plan (Clark Consulting Services, 2003). Mapping of land-use designations, as identified by the Township, is provided in **Technical Appendix C6 – Socio-Economic Profile**.

4.1 WETLANDS

4.1.1 Wolfe Island Wetlands

Twelve individual shoreline and riverine wetlands totaling nearly 1,400 ha have been complexed into the Provincially Significant Wolfe Island Wetland Complex (MNR, 1986a). Seven of these wetlands (Barrett Bay, Brown's Bay, Bayfield Bay, Button Bay, Big Sandy Bay, Reeds Bay, and Sandy Bay wetlands) are located within the Wolfe Island portion of the study area **(Figure 4.1, Appendix A)**. The majority of the complex is marsh (78%), with some swamp (20%) and bog (2%). The complex has been identified as a provincially significant waterfowl staging and production area (MNR, 1986a). The complex also provides colonial waterbird nesting for Black-crowned Night-Heron (*Nycticorax nycticorax*) (S3[1] - vulnerable in Ontario) and Black Tern (*Chlidonias niger*) (S3 – vulnerable in Ontario and a provincial species of Special Concern), as well as feeding habitat and good winter cover for furbearers and winter birds. The wetland complex is of negligible significance for migratory passerines and shorebirds (MNR, 1986a). Each of the wetlands within the Wolfe Island study area provides habitat for provincially and regionally significant species of flora and fauna according to their respective wetland evaluation data records (MNR, 1986a-g).

Big Sandy Bay Wetland is the largest wetland on Wolfe Island and is designated as an International Biological Program site, a provincially significant Life Science Area of Natural and Scientific Interest ("ANSI"), and a provincially significant Earth Science ANSI. The Big Sandy Bay Wetland and ANSIs cover approximately 500 ha at the southwest end of Wolfe Island, and represents coastal shore and wetland environments, typical of the site district, while also exhibiting some distinctive features such as excellent development of sand dune bar and peatland heath and forest complexes that are somewhat unique for the district. Day-use recreational trails through the dunes are present. Rare species noted within the wetland include Caspian Tern (*Sterna caspia)* (S3), Least Bittern (*Ixobrychus exilis)* (S3), and arrow-arum (*Peltandra virginica*) (S2), an aquatic plant species (MNR, 1986b). The MNR has identified this wetland as regionally significant for waterfowl production.

[1] S-Ranks are measures of provincial status determined by the Ministry of Natural Resources. A summary of S-Ranks is provided in Table 4.3.

The Sand Bay Wetland, located at the northwest end of Wolfe Island, is a 65 ha wetland composed of 10% swamp and 90% marsh. According to the wetland evaluation data record for this wetland (MNR, 1986c), both provincially and regionally significant species have been observed in this feature. Provincially significant species recorded include the Canvasback (*Aythya valisineria*) (S1,S2) and Redhead ducks (*Aythya americana)* (S2), Caspian Tern, and grass-leaved water-plantain (*Alisma gramineum)* (S3S4), a species of aquatic plant. Regionally significant waterfowl species observed include the Lesser Scaup (*Aythya affinis*) (S4) and Goldeneye (*Bucephala clangula*) (S5). This wetland is considered a regionally significant waterfowl staging area, and a locally significant area for waterfowl production (MNR, 1986c).

Reeds Bay Wetland covers 27 ha on the western shore of Wolfe Island and is comprised of 100% marsh vegetation. Background information on this wetland was obtained primarily from the wetland evaluation data record (MNR, 1986d). This wetland is known to host an average of two or more educational visits per year. Six provincially significant migrant and breeding bird species have been observed in this wetland, and include the Caspian Tern, Hudsonian Godwit (*Limosa haemastica*) (S2S3), Stilt Sandpiper (*Calidris himantopus)* (S2S3), Short-billed Dowitcher (*Limnodromus griseus)* (S2S3), Black-crowned Night-heron, and Least Bittern. Grass-leaved water-plantain, a provincially significant aquatic plant species, has also been observed in the Reeds Bay Wetland. Regionally significant bird species including Green Heron (*Butorides virescens)* (S4), Swamp Sparrow (*Melospiza georgiana*) (S5), Green-winged Teal (*Anas crecca*) (S4), Virginia Rail (*Rallus limicola*) (S4) and Common Loon (*Gavia immer*) (S4) have also been noted within this wetland. The Reeds Bay Wetland is considered regionally significant for waterfowl staging and fish spawning/rearing habitat, and locally significant for waterfowl production (MNR, 1986d).

Button Bay Wetland is composed of 2% swamp and 98% marsh vegetation and encompasses 95 ha at the south end of Wolfe Island. Provincially significant wildlife known to use this wetland include the Least Bittern, Redhead, Canvasback, Caspian Tern, and Black Tern. The provincially significant grass-leaved water-plantain is also present within this wetland (MNR, 1986e).

Bayfield Bay Marsh, occupying 506 ha in a sheltered bay in the eastern portion of the study area, is comprised of 3% swamp and 97% marsh. This wetland is known to support commercial bait fish harvesting and experiences relatively intense hunting activity (MNR, 1986f). Several provincially rare species have been recorded in this feature, and include Black Tern, Canvasback, and grass-leaved water-plantain. Regionally significant species include the Osprey (*Pandion haliaetus)*, Goldeneye, Lesser Scaup, Green-winged Teal and Virginia Rail. The OMNR has identified this wetland as a provincially significant waterfowl staging and production area. Further, OMNR considers this wetland as providing regionally significant fish spawning and rearing habitat.

Brown's Bay Wetland, at the north end of the Wolfe Island portion of the study area, is made up of two marsh communities, occupying a total of 140 ha. An incomplete wetland evaluation record was available for this area (MNR, 2006a), however, this area is known to provide habitat for provincially significant wildlife (MacIntyre and Sine, 1986).

Barrett Bay Wetland is a single wetland community, composed of 100% marsh and encompasses 34 ha near the north end of the Wolfe Island study area (MNR, 1986g). This wetland is identified as hosting two or more educational visits per year. Provincially significant species known to utilize this wetland include the Least Bittern, Black Tern, Short-billed Dowitcher, and grass-leaved water-plantain. Regionally significant species noted include the Swamp Sparrow, Green Heron and Virginia Rail. This wetland is considered regionally significant for waterfowl staging, and locally significant for waterfowl production (MNR, 1986g).

The Wolfe Island portion of the study area also supports several small areas of unevaluated or non-provincially significant wetlands. These wetland areas are generally comprised of swamp and marsh communities, with minor representation of bog habitat. All wetlands are shown on **Figure 4.1 (Appendix A)**.

4.1.2 Kingston Mainland Wetlands

The Little Cataraqui Creek Provincially Significant Wetland ("PSW") Complex is at the eastern boundary of the mainland study area. This is a 360 ha coastal and riverine wetland is comprised of three individual wetlands classified as marsh (72%) and the remaining lands identified as swamp (28%). The southern portion of this wetland, near the mouth of Little Cataraqui Creek, is also identified as an International Biological Program site. In addition to its flood attenuation and water quality improvement functions, this wetland complex has been identified as supporting Black-crowned Night-Herons, Caspian Terns, Black Terns, and Least Bitterns (MNR, 2004). Sightings of map turtles (*Graptemys geographica*) (S3), which are considered species of Special Concern by both the Committee on the Status of Species At Risk in Ontario ("COSSARO") and the Committee on the Status of Endangered Wildlife in Canada ("COSEWIC"), were recorded during the wetland evaluation process (MNR, 2004). This wetland is also considered as a regionally significant waterfowl staging and breeding area (MNR, 2004).

A Ducks Unlimited Canada ("DUC") wetland and upland conservation project was undertaken on Frontenac Institution land in 1999 with the co-operation and support of Corrections Services Canada, Environment Canada and the Kingston Wetlands Working Group (DUC, pers. comm., 2007).These wetlands are not currently designated as provincially significant by the MNR.

Prior to the wetland conservation project, the Frontenac Institution Farm property consisted of 342 ha of land with a 35.6 ha section of marginal pastureland that contained degraded wetlands. The impairment of wetland function resulted from extensive drainage, and agricultural pressures including cropping and intensive cattle pasturing. These impacts reduced wetland hydroperiods, causing wetlands to only hold water temporarily during the spring runoff period (DUC, pers. comm., 2007).

The wetland conservation project involved the restoration of wetlands, exclusion of cattle within the riparian areas of the wetlands, and implementation of best management practices on the remaining viable pastureland for the benefit of waterfowl, other wildlife and the farming operation (DUC, pers. comm., 2007).

Wetland restoration involved restoring the historic hydrology of six of the largest degraded wetlands through the installation of clay plugs and small water control structures in existing ditches. To improve upland habitat for wildlife and provide protection to the wetlands, a series of cattle exclusion fences were installed. The remaining viable pastureland in the 35.6 ha block was improved with appropriate seed, fertilizer and pasture management practices (DUC, pers. comm., 2007).

Today the project is an excellent demonstration of how wetland conservation and agriculture can work together. The restored wetlands are providing a highly productive and diverse habitat for many forms of wildlife and are not drying up and becoming overgrown with vegetation as they once did. Dairy cattle are using the enhanced pastureland but do not detrimentally impact the wetlands and the water flowing through the property due to the cattle exclusion fencing (DUC, pers. comm., 2007).

Inspections of the project are undertaken annually and the site continues to provide an excellent venue for demonstration tours for both rural landowners and the public (DUC, pers. comm., 2007).

4.2 VEGETATION COMMUNITIES

The study area is located within the Great Lakes Forest Region's Huron-Ontario Section (Rowe, 1972). Natural upland forest cover is generally dominated by sugar maple (*Acer saccharum)*, American beech (*Fagus grandifolia)*, basswood (*Tilia americana*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis)*, and eastern white pine (*Pinus strobus*). Forests of silver maple (*Acer saccharinum)*, balsam poplar (*Populus balsamifera*), white elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), black ash (*Fraxinus nigra*), and eastern white cedar (*Thuja occidentalis*) generally develop in lowland areas.

Natural vegetation within the study area has been significantly altered by anthropogenic activities, including clearing and draining of land for agricultural purposes on Wolfe and Simcoe islands. The mainland portion of the study area has also been historically altered by agricultural uses as well as urban expansion. Non-agricultural vegetation communities, including both natural (e.g., woodlots, coastal marshes and some riparian corridors) and cultural (e.g., old field meadows, thickets, plantations and hedgerows) have a scattered and fragmented distribution throughout the island and mainland portions of the study area. Areas of significant natural cover are limited to a number of PSWs (previously described) located along the shorelines of both Wolfe Island and the Kingston mainland. Significant natural areas in the study area are shown in **Figure 4.1 (Appendix A)**.

Several areas on Wolfe Island have been designated as Environmentally Sensitive Areas ("ESA") in the Township of Frontenac Islands Official Plan (Clark Consulting Services, 2003). According to the Official Plan, ESAs can include PSWs, valleylands, ANSIs, non-provincially significant wetlands, large tracts of vegetation, areas of groundwater recharge and discharge, fish and wildlife habitat, habitat of endangered species, and other areas identified by the

Municipality. ESAs within the study area include some woodlots and the PSWs, and these features are shown on **Figure 4.1** (**Appendix A**). A brief discussion of the ESA designation is provided in **Technical Appendix C6 – Socio-Economic Profile**.

Review of the NHIC database indicates that there are two rare vegetation community types associated with the Big Sandy Bay ANSI and PSW **(Figure 4.1, Appendix A)**. One community is described as a graminoid coastal meadow marsh and is considered provincially and globally Very Rare (S2, G2?). The community is an extensive sandy bay complex formed on level limestone shoreline. The second significant community is described as a little bluestem-switchgrass-beachgrass dune grassland, considered provincially Very Rare (S2, G?).

Stantec undertook a vegetation community assessment of major portions of the Wolfe Island and Kingston mainland study areas using Ecological Land Classification (ELC) for Southern Ontario (Lee et al., 1998) on July 17 and 18 and December 6, 2006 and February 21, March 19, and October 18, 2007. Lands in the vicinity of the temporary roads and the proposed mainland and Wolfe Island cable crossing landfall locations were surveyed on foot **(Figure 4.2, 4.3, 4.4 Appendix A)** and the remainder of the Wolfe Island study area was surveyed from the roadside **(Figure 4.5, Appendix A).** Community descriptions are provided in **Table 4.1 (Appendix B)**.

The majority of the Wolfe Island study area consists of agricultural cover, including primarily hay, corn, fallow fields and pastures. Naturalized areas of cultural origin are present in numerous locations, including plantations and cultural woodlands and thickets of various compositions. Natural vegetation communities in the Wolfe Island study area are limited to remnant deciduous and mixed forest patches, isolated deciduous or thicket swamps, and the extensive wetlands that are present along the shorelines. The Kingston mainland study area consists of thin strips of forest communities along the shoreline, cultural meadows and thickets, agriculture, and wetlands.

There are five woodlots in the Wolfe Island portion of the study area that are greater than 10 ha in size. The largest is the forest and swamp habitat on the fringe of the Big Sandy Bay wetland, which totals approximately just over 101 ha. This wooded area contains a large amount of edge habitat, as it is comprised of a long, narrow band along the Big Sandy Bay marsh and thicket swamp, with a larger bulb at the northwestern section.

Other woodlots greater than 10 ha in size include a feature fronting on Bayfield Bay, east of Concession 9 between Wilmer Road and the unopened Reeds Bay Road allowance (28.2 ha), an upland mixed forest feature at the southeast corner of Baseline Road and Concession 7 (26.8 ha), an upland deciduous forest feature just south of Button Bay, north of Highway 95 (19.6 ha), and some patchy lowland forest in the unnamed creek riparian zone east of Sand Bay wetland (16.4 ha).

The majority of the communities that were observed in the study area and have been assigned a rank by the NHIC are considered Secure (S5) in Ontario. The buttonbush mineral swamp thicket (SWT2-4) located in the northern portion of the Wolfe Island study area, is ranked S3 (Vulnerable in Ontario), but is globally Apparently Secure (G4).

4.3 WILDLIFE

Targeted wildlife field studies were conducted for specific groups of species, and the results are presented in separate technical appendices: **Technical Appendices C2, C5, C8 and C9** contain information on amphibians, birds, butterflies and bats, respectively. Secondary source data were used to determine the presence or potential presence of other groups of wildlife within the study area. In addition to the sources listed in the other technical appendices, information was compiled from:

- Ontario Herpetofaunal Summary Atlas (Oldham and Weller, 2001) which illustrates known occurrences of herpetile species in Ontario;
- Atlas of Mammals of Ontario (Dobbyn, 1994) which documents the known ranges of the mammals of Ontario;
- Ontario Breeding Bird Atlas (www.birdsontario.org) and Christmas Bird Count results (National Audubon Society, 2006) was undertaken in order to identify further accounts of avian species in the vicinity of the study area;
- A publication by the Great Lakes Fishery Commission, entitled *Fish-community objectives for the St. Lawrence River* (La Pan et al., 2002) which contains a description of historical and current fish communities in the upper St. Lawrence River, including a consolidated species list derived from several field programs in the region dating from 1931 to 1996;
- Wetland evaluation records, provided by the MNR;
- Detailed wildlife surveys, which included mammals, birds, fishes, herpetiles, aquatic insects, dragonflies and butterflies that were completed in 2004 by the Kingston Wetlands Working Group (Bonta et al., 2004);
- Restoration and Enhancement of the Fish and Wildlife Habitat of the Wolfe Island Canal (Stringer's Environmental Services and AsiOtis Natural Heritage Consultants, 2005)
- The Wolfe Island Wind Project Environmental Impact Statement / Environmental Screening Report (Acres International Limited, 2005), and;
- Aquatic habitat classifications (MNR, 2006; CRCA, 2006).

4.3.1 Terrestrial Wildlife

The majority of the study area has been historically cleared to accommodate agricultural land uses and urban expansion. Remaining natural cover is limited to areas with poor drainage, hedgerows, and small remnant patches of isolated upland forests. **Figure 4.1 (Appendix A)** illustrates significant natural areas in the study area.

Records from the Atlas of the Mammals of Ontario (Dobbyn, 1994) indicate that 28 species of mammals have been recorded within the vicinity of the study area. All of these species are Secure or Apparently Secure (S4, S5) in Ontario. The NHIC database contains a record of one rare species, the grey fox (*Urocyon cinereoargenteus)* (SZ) on Wolfe Island.

Incidental field observations of mammals were recorded during the evaluation of wetlands around Wolfe Island (MNR, 1986a-g). Mammals typically associated with the large PSWs on the island include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*) and mink (*Mustela vison*). Beaver activity (i.e., a small beaver dam and nearby beaver cuttings) was observed near the headwaters of Bueters Creek on Lots 5 and 6, Concession 8 SBL during the 2004 field investigations by Acres International Limited. However, due to the limited wetland habitat in the Island's interior, these species (beaver, muskrat, mink) primarily inhabit the large coastal wetland areas.

White-tailed deer (*Odocoileus virginanus*) are abundant on Wolfe Island. Deer were observed during most field investigations by Stantec staff, and at many locations, either foraging in agricultural fields, moving along fencerows and woodlot edges, or within the woodlots or thicket areas. In March, 2005, two groups of 50 and 60 individuals were observed (at the corner of 3rd Line and Baseline Road, and west of 7th Line south of Baseline Road, respectively), and discussions with local residents indicate herds larger than these are common. Deer yards are areas of key winter habitat for white-tailed deer. They usually consist of a coniferous forest, which provides shelter from snow and wind, adjacent to an area of deciduous forest or other foraging habitat. According to mapping provided by MNR (2006), there are no significant deer yards in the study area.

Other mammals that may be associated with terrestrial habitats on Wolfe and Simcoe Islands include red fox (*Vulpes vulpes*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), eastern cottontail (*Sylvilagus floridanus*), European hare (*Lepus europaeus*) and a variety of small rodent species (e.g., voles, squirrels, chipmunks, mice) (Stringer's Environmental Services and AsiOtis Natural Heritage Consultants, 2005). Two road-killed striped skunks were noted during the fieldwork conducted in March, 2005.

A variety of small rodents (e.g., squirrels, chipmunks, mice) tolerant of urban conditions are likely present in the Point Pleasant/Paterson Park area and the riparian and wetland areas within the mainland portion of the study area. The Little Cataraqui Creek PSW provides habitat for several common fur-bearing mammals (MNR, 2004), including beaver, muskrat, mink, coyote, woodchuck (*Marmota monax)*, white-tailed deer and red fox (Bonta et al., 2004).

4.3.2 Wetland Wildlife

There are several areas of wetland habitat throughout the study area, as described in **Section 4.1**. These wetland habitats likely support a wide range of species, particularly migrating waterfowl, amphibians, and reptiles. Many of the larger seasonally wet areas, including ephemeral woodlot ponds, swamps, marshes, and agricultural ponds, have been observed by Stantec staff to provide breeding habitat for frogs. The Ontario Herpetofaunal Summary Atlas

(Oldham and Weller, 2001) indicates that twenty-four species of reptiles and amphibians have been recorded within the vicinity of the study area, six of which are considered provincially rare: common musk turtle (*Sternotherus odoratus*) (S3), map turtle, Blanding's turtle (*Emydoidea blandingii)* (S3), eastern milksnake (*Lampropeltis triangulum)* (S3), black rat snake (*Elaphe obsoleta obsolete)* (S3), and northern ribbonsnake (*Thamnophis sauritus septentrionalis)* (S3). Significant species are discussed in more detail in **Section 4.5**. Further discussion of amphibian and reptile species is provided in **Technical Appendix C2 – Herptile Report.**

4.3.3 Aquatic Habitats

Data collection efforts in aquatic habitats were focused on watercourse characteristics as presented in the "Draft Guidelines to Assist MNR Staff in the Review of Wind Power Proposals In or Near Water (Including Water Crossings): Potential Impacts to Fisheries" (MNR, 2006b).

Aquatic habitats can be natural rivers, streams, lakes, ponds, wetlands, or municipal drains. Streams and municipal drains are separated into three general categories based on thermal regime: cold, cool, and warmwater. All watercourses in the study area have been classified as warmwater (MNR, 2006a) and are shown in **Figure 2.1 (Appendix A)**. Warmwater habitats are those where water temperatures reach daily maximums in excess of 25°C (as defined using sampling the DFO [1999] sampling protocol entitled: *A simple method to determine the thermal stability of southern Ontario streams*).

Aquatic habitats on Wolfe Island include intermittent, open channel drainage swales and intermittent and/or permanent creeks and ponds, as well as a single man-made canal linking Barrett and Bayfield Bays (Lake Ontario Waterkeeper, 2006). The majority of the aquatic habitat on the island is degraded and highly intermittent in nature, leading to a DFO fish habitat classification of "Marginal" (formerly MNR Type 3). Marginal habitats have low productive capacity or are highly degraded, and do not contribute directly to fish productivity. The lower reaches of the larger creeks of the Island provide the main body of permanent fish habitat, due for the most part to the intermittent nature and associated poor habitat quality of the upper reaches. These creeks represent "Important" (formerly MNR Type 2) habitat with limited spawning and rearing habit for some species of fish migrating upstream from Lake Ontario. Important habitats do not limit the productivity of fish and are not considered critical habitat. The man-made canal also represents warmwater fish habitat, as indicated by species found in the immediate vicinity (Lake Ontario Waterkeeper, 2006). Improvements to the canal, primarily in the form of dredging, have been proposed by the Wolfe Island Development Review Committee to increase the quality of fish habitat in the canal (Stringer's Environmental Services and AsiOtus Natural Heritage Consultants, 2005; Lake Ontario Waterkeeper, 2006).

On the mainland, the Little Cataraqui Creek, including the West Branch that runs through the study area, does not contain any limiting fish habitat types (i.e., there are no features that are rare or critical to species, that do not exist elsewhere locally in substantial quantity). Both areas are warmwater, shallow systems, with the presence of such fish species as largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), various species of sunfish (*Lepomis spp*.), and brown bullhead (*Ameiurus nebulosus*) (CRCA, pers. comm., 2006). Fish community

sampling in the vicinity of the proposed transmission line crossing of the West Branch of Little Cataraqui Creek, was completed by backpack electrofishing in June 2007. This effort resulted in the capture of seven species including creek chub, bluntnose minnow, northern pike, white sucker, fathead minnow, pumpkinseed, and central mudminnow.

Review of existing information and a field survey completed by Stantec in January 2007, indicate that there are two branches of the West Branch of the Little Cataraqui Creek that converge within the wetland restoration project east of Days Road. The West Branch (or northern reach) is generally shallow (average of 20 cm) with permanent flow. The margins of the watercourse are well vegetated with cattails and grasses, providing adequate bank stability. The 4 m wide channel is well defined with substrate consisting of a mixture of sand and gravel with small proportions of silt and detritus. There is evidence that during high flows, the wetted width can increase to approximately 7 m. Water quality measurements (pH, D.O., temperature) taken on site were within acceptable tolerances for fish species that are anticipated to be present at this location, based on CRCA catch results in the nearby main stem of the Little Cataraqui Creek. The southern reach (an unnamed tributary), located approximately 100 m north of Hyde Street originates at the culvert under Days Road. It conveys permanent, but very shallow flow through a well defined channel. Banks are generally stable, being densely vegetated with a mixture of herbaceous species. Substrate material predominantly consists of sand and silt. In the vicinity of the proposed transmission line crossing, the West Branch of Little Cataraqui Creek has a wetted width of approximately 3.5 m, with water depths generally ranging from 0.6 to 0.8 m. Gentle topographic relief results in a low channel bed gradient with flow morphology mainly characterized a long slow flat. Submergent and emergent aquatic vegetation provides about 90% coverage of the predominately clay, muck and silt substrate.

Some aquatic habitat within the study area has the potential to support significant reptile species. Common musk turtles utilize a variety of habitats, preferring permanent bodies of water such as lakes, slow-moving streams, and wetlands. Map turtles are known to prefer large bodies of water, such as rivers and lakes. The Blanding's turtle is essentially aquatic, but can sometimes be found wandering on land near marshes, bogs, lakes or small streams. In addition, the northern ribbonsnake is most often found near aquatic habitats such as marshes, lakes, and streams.

Specific discussion of the aquatic habitats and fisheries resources within the Lower Gap is provided in **Appendix C10 – Submarine Cable Crossing Report**.

4.4 WILDLIFE CORRIDOR AND HEDGEROW STUDY

Additional field investigations were undertaken to characterize wildlife corridors within the study area on Wolfe Island. These studies were undertaken to address concerns raised by a stakeholder (Dr. Day), as well as to better characterize over-all wildlife usage of the study area. The following clarification of terms, and much of the following discussion, is based on a review of relevant scientific literature (Dawson, 1994; Bennett 1990; and Simberloff, et al. 1992), in combination with results of field investigations.

4.4.1 Definition of Terms

The term “corridor” has at least six different types of usage in the scientific literature (Simberloff, et al. 1992). It is often used in a fairly broad sense as a linear habitat strip, which is connected to other habitat areas that are wider and have higher biological diversity than the corridor. The term implies that there is or could be movement of wildlife, including invertebrates and plants, between larger habitat areas along the corridors. The term also applies to relatively narrow habitat patches that “can lead animals and plants into its length even when there is no larger habitat patch at its end” (Simberloff, et al. 1992).

The term “matrix” refers to the landscape surrounding a corridor system. It is the area that the corridors pass through. The nature of the matrix has a significant impact on corridor functions. If the matrix is agricultural land, many wildlife species may actually prefer to travel and forage in the matrix rather than the corridor. If the matrix is dense urban development with little vegetation cover, most species will be restricted to movement in the corridor.

4.4.2 Identification of Corridors

Corridor analysis stands on a broad base of theory, which has been under discussion in the scientific literature since the 1960s. Dawson (1994) includes an extensive review of the theory behind habitat corridors and identifies the following potential functions for habitat corridors:

- Recolonization of isolated habitat patches after local extinctions.
- Linking small habitat patches into a larger functional unit, which meets habitat needs that are not met by the individual patches on their own.
- Migratory movement.
- A means to escape the effects of global warming.
- Facilitate gene flow across the landscape.

As Dawson (1994) states, “These purposes require corridors at a variety of spatial scales”. Of the five potential functions, four could theoretically occur at the scale of the Project. Global warming is a process well outside the scale of the study area.

The Significant Wildlife Habitat Technical Guide (“SWHTG”) (MNR, 2000) provides guidance for identifying animal movement corridors. The SWHTG recommends the use of mapping, aerial photography, and a sound knowledge of species’ habitat requirements to identify corridors. The first step in determining corridors is to identify other natural heritage features, including significant wildlife habitat, between which wildlife species are likely to move. Once such features have been mapped, connecting corridors can be identified. The SWHTG provides examples of corridors, including:

- Relatively steep and undeveloped river valleys and riparian zones;
- Most probable linkages to and from known wildlife habitat;

- Unopened roadways and rail allowances;
- Hedgerows, windbreaks, and old fields that could function as animal movement corridors; and,
- Sparsely vegetated areas can also function as corridors. Many wildlife species move freely through agricultural lands to reach natural areas.

Corridors often provide permanent or breeding habitat for plants or wildlife. In such cases, dispersal along the corridor would be gradual.

The SWHTG suggests that a corridor may be beneficial for some species but detrimental to others. "For example, narrow linear corridors (such as hedgerows) may concentrate breeding species. Raccoons, cats, and other predators can quickly decimate these populations. Also, narrow corridors dominated by edge habitat may encourage invasion by weedy generalist plants and opportunistic species of birds and mammals" (MNR, 2000).

4.4.3 Plant and Wildlife Usage of Corridors

The following review of functions is based on an evaluation of the plant and animal species that occur or may potentially occur on Wolfe Island and their habitat requirements. Organisms respond to potential corridors in species-specific ways as well as landscape-specific ways, e.g., to the degree of contrast between the characteristics of the corridor and that of the surrounding matrix (Rosenberg et al., 1997; Beier and Noss, 1998).

Prior to discussing individual species requirements for corridors, a general description of corridor usage is presented. There are certain large groups or guilds of species that simply do not require corridors, or which require corridors large enough to replicate interior forest conditions to provide suitable habitat to allow them to move across the landscape.

4.4.3.1 Species Groups That Do Not Use Corridors

The first major species group is plants. Considerable study has been done on the mechanisms of plant dispersal (see Sauer, 1998 for an overview). The seeds of most plants are spread either by wind or wildlife. Plants with seeds that spread by wind have excellent dispersal capability, and corridors are not necessary for their colonizing new habitat or having new genetic stock introduced to existing populations.

Wildlife may move plant seeds considerable distances. It has been demonstrated that waterfowl may carry seeds attached to their feathers for distances of several hundred kilometers. Similarly, birds may ingest seeds and fruits and excrete them elsewhere. Even frogs and salamanders may transport plant seeds from one habitat to another.

The majority of forest-interior plant species are relatively poor at dispersing. Many of them reproduce asexually, and dispersal occurs slowly by cloning. Even very wide corridors that contain interior habitat are not effective in helping these species move from one area to another.

Plant species that are dispersed by wind and animals will become established in corridors if the habitat is suitable. However, corridors are not necessary for these species to become established in other core areas. Plants with specialized habitat requirements will not migrate along corridors unless the corridors replicate their habitat requirements. The plant species that appear to move most readily along corridors are those with a wide range of habitat tolerance that are very prolific and aggressive, such as some of the non-native grasses and mustards.

Another major group of species that apparently does not rely on corridors for movement from one core area to another is birds (Beier and Noss, 1998). Although wooded strips may function as travel lanes for some open-country species, they are not essential for dispersal (Haas, 1995). Birds simply fly from one area to another without relying on corridors. Even during post-breeding dispersal, young fly to other habitat areas without using corridors. Although corridors are not essential to dispersal, they may provide habitat for various species of birds. Often corridors are used as territorial boundaries by species that nest in open habitat, and a corridor may increase nesting density of some species. Common edge species such as Song Sparrows may nest in or at the edge of corridors. However, there is some evidence that predation of nests is more frequent in linear strips of habitat (Major et al., 1999).

Other groups of species that do not need corridors for dispersal are butterflies, spiders and insects that drift long distances in the air. It has been demonstrated that there is a constant flow of invertebrates in the air akin to zooplankton in water. Thus, there is a constant rain of invertebrates on the soil and these species survive where they fall in suitable habitat. Thus, a series of “stepping stones” of suitable habitat scattered across the landscape may be more viable than distinct corridors for many invertebrates. Other invertebrates may spread along corridors if suitable habitat for their different lifecycle stages is available. These habitat requirements are usually related to moisture and substrate conditions and do not seem to be related directly to corridor width. Butterfly use of open habitat corridors through a forested landscape, rather than a forested corridor, has been demonstrated (Haddad, 1999).

4.4.3.2 Species Groups That May Use Corridors

Three groups of wildlife may use corridors to travel across the landscape: amphibians, reptiles, and mammals. Some amphibians breed in woodland pools and spend the summer in moist meadows, and certain salamanders may move between breeding and wintering habitats. In Oregon, salamander immigration rates resulting from movement along corridor and non-corridor pathways were similar (Rosenberg et al., 1997). Grassy corridors are preferred by these species, and they may also move across manicured areas such as lawns. These species are susceptible to uptake of environmental contaminants through their skin, so may be adversely affected by herbicides on lawns. They are also vulnerable to being killed by vehicles if roads intercept their travel paths.

Little is known of reptile use of corridors. Certain snake species move between nesting areas, summer habitat, and winter hibernacula. They also prefer grassy areas or herbaceous meadows, and some structure such as fallen logs is beneficial. Snakes are less likely to cross manicured areas than amphibians, but they do cross lawns occasionally. Certain turtle species

may move between nesting sites and summer habitat. Snakes and turtles are also vulnerable to being killed crossing roads.

Width of corridors required by amphibians and reptiles is variable, and little is known for many species. The amphibians most likely to use corridors in the Wolfe Island study area include western chorus frogs, northern leopard frogs and bullfrogs. Amphibians will utilize both upland and riparian corridors to move between habitats. Reptiles that may utilize corridors in the study area include common garter snake (*Thamnophis sirtalis)*, eastern milksnake, black rat snake, northern ribbonsnake, northern watersnake (*Nerodia sipedon sipedon)*, brown snake (*Storeria dekayi)*, northern ring-neck snake (*Diadophis punctatus)* and northern red-bellied snake (*Storeria occipitomaculata)* if these species are present on the island.

Mammal usage of corridors is variable among species. Some species almost never use corridors; some are indifferent to corridors, using them casually if they happen to lead to where the animal wants to go; while some species prefer to use corridors if they are moving among core areas.

Those that avoid corridors are little brown bat (*Myotis lucifugus)* and big brown bat (*Eptesicus fuscus)*. Other bat species occur on Wolfe Island, particularly when migrating, such as the red bat (*Lasiurus borealis)* and hoary bat (*Lasiurus cinereus)*. None of the bat species use corridors.

Species that are rather indifferent to corridors include coyote, red fox, and white-tailed deer. The coyote and fox tend to avoid corridors when traveling across the landscape, preferring to stay out in the open. They may, however, occasionally hunt in corridors. Deer tend to travel directly to where they want to go, and are more likely to move in the open than along a corridor. One exception is deer migration corridors. These are traditional routes that are used by deer to reach wintering areas from the summer habitat, and they tend to be in heavily forested areas (A. Sandilands, pers. comm.).

4.4.3.3 Species Groups That Usually Use Corridors

Species that do prefer to use corridors may be subdivided into those that prefer riparian corridors and those that use upland corridors. Riparian corridor species include the muskrat and mink. Both have been observed within the study area. These species travel either in watercourses or along streambanks.

Species that prefer to use upland corridors are masked shrew (*Sorex cinereus)*, smoky shrew (*Sorex fumeus)*, northern short-tailed shrew (*Blarina brevicauda)*, eastern cottontail, woodchuck, deer mouse (*Peromyscus maniculatus)*, white-footed mouse (*Peromyscus leucopus)*, meadow vole (*Microtus pennsylvanicus)*, meadow jumping mouse (*Zapus hudsonius)*, and ermine (*Mustela erminea)*. Many of these species were not observed in the study area, but it is possible that they are present. Other species that will commonly use these upland corridors are grey squirrel (*Sciurus carolinensis)*, red squirrel (*Tamiasciurus hudsonicus)*, eastern chipmunk (*Tamias striatus)*, raccoon, and striped skunk. None of these species require very wide corridors, and have been regularly observed moving along and living in corridors 5 to 15 m wide

(Bennett et al., 1994; Andreasson, 1996; Rosenberg et al., 1997). Corridors should have adequate ground cover in the form of tall grasses and forbs to provide protection from predators while smaller mammals are moving through the corridor. Some species also prefer shrub and tree cover including eastern chipmunk, eastern cottontail, ermine, the squirrels, and raccoon. Limbs, logs, and other downed debris enhance habitat for eastern chipmunk, eastern cottontail, and ermine.

4.4.4 Field Investigations: Approach

Areas of wildlife habitat in the Wolfe Island study area were identified using Ecological Land Classification information (**Section 4.2**) in conjunction with field observations and winter wildlife surveys. Winter wildlife surveys were conducted on February 21 and March 5 and 6, 2007 and consisted of visiting potential upland wildlife habitat, and recording wildlife movement and numbers inferred through the examination of tracks in the snow. Information collected during the field investigations was analyzed to identify potential wildlife movement corridors.

In addition, a total of eighty-three hedgerows in the Wolfe Island study area were investigated (**Figure 4.6, Appendix A**), with the dominant canopy and understory species, height and width, and percent cover recorded for each hedgerow. Each hedgerow was assessed for features that provide special utility for wildlife, including special habitat potential (i.e. mast species and nesting potential), and corridor/connectivity value where a hedgerow linked two natural cover habitat types.

4.4.5 Field Investigations: Findings

A summary of hedgerow observations is provided in **Table 4.2 (Appendix B)**.

Large mammals such as white-tailed deer, coyote and red fox most commonly used open agricultural fields for movement between habitat patches. They were observed to occasionally forage in hedgerows, particularly hedgerows containing browse for deer or habitat for rodent populations for coyote and fox prey. Incidental observations of large mammals throughout the agricultural fields in the Wolfe Island study area during field investigations support the published information that indicates these animals prefer to move in open fields. The deer, red foxes and coyotes tended to move in direct paths through agricultural lands, showing no preference for one type of crop.

Deer typically have seasonal migration corridors to wintering grounds. However, no such deer migration areas have been identified within the study area. Many deer on the island appear to use similar areas in both winter and summer. This could be in part due to the deer's limited habitat options on the island. The deer also appear to be able to take advantage of foraging in agricultural fields during winter months, as the windswept nature of the island prevents deep snow accumulations. Observations of deer movement in the study area suggest that most movement is local, between sheltered natural areas and agricultural fields for foraging. Although deer are common throughout the study area, **Figure 4.6 (Appendix A)** shows areas identified as having higher concentrations of local activity.

The majority of the hedgerows on Wolfe Island have limited utility for wildlife, as they are often narrow with limited tree cover. As discussed above, the value of hedgerows as corridors may be limited in an agricultural setting. However, the hedgerow study has identified some hedgerows of potential value. Most hedgerows provided dense tall grasses and forbs, which would be used as shelter by small mammals such as mice and shrews. Several hedgerows showed special habitat potential either for their mast value (hedgerows 2, 29, 30, 38, 52, 76) or for thicket bird nesting habitat (hedgerows 15, 22) (**Figure 4.6, Appendix A**). Hedgerows 1 and 83 occur along small watercourse, providing potential habitat for reptiles and amphibians.

Hedgerows 72, 73 and 83 (**Figure 4.6, Appendix A**) have received supplemental plantings by the landowner. These hedgerows could provide habitat for a variety of wildlife including breeding birds, browsing deer, wintering turkeys, amphibians, reptiles and small mammals.

Hedgerows 1, 26, 32, 45, 46, 64, 65 and 78 (**Figure 4.6, Appendix A**) connect distinct patches of natural cover habitat, and therefore may have corridor/connectivity value for some species.

4.4.6 Conclusions

The corridor and hedgerow study has identified areas of local deer movement in the western, eastern, and northwestern portions of the study area. These areas of local movement tend to be associated with the larger areas of naturalized vegetation cover. Several hedgerows with the potential to provide wildlife habitat and/or corridor functions were identified.

Generally the hedgerows do not provide valuable corridors as they do not have interior habitat conditions. It is interior habitat conditions that are most scarce on Wolfe Island. Disconnected rectangular or circular “stepping stones” of natural areas, each with some degree of interior habitat, are of greater ecological benefit in agricultural landscapes than the same area of long linear corridors (i.e. hedgerows), even if well connected. From this perspective, linkage functions of hedgerows within the study area are limited and provide relatively low ecological benefits. The majority of wildlife movement is likely to occur through the open agricultural fields.

4.5 SIGNIFICANT SPECIES

Significant species are defined as those with provincial rankings of S1, S2 or S3, or those tracked by the MNR. Also, significant species are those given status rankings by the federal COSEWIC and/or the provincial COSSARO as rare, threatened or endangered according to federal and provincial regulations. The potential for the use of the study area by significant species was determined using several methods. The NHIC database was searched and the MNR was contacted to solicit information on significant species within the study area. Discrepancies in the number and locations of significant species records in the study area were addressed via follow-up correspondence with the NHIC and MNR.

Table 4.3 (Appendix B) lists significant species that have the potential to occur in the study area based on the above information sources.

Eight significant species with confirmed occurrences have been identified by the MNR within the study area **(Table 4.3, Appendix B)**. These species are branching bur-reed (*Sparganium androcladum)* (S1), arrow arum, King Rail (*Rallus elegans)*, Black Tern, Black-crowned Night-heron, Least Bittern, Henslow's Sparrow (*Ammodramus henslowii)* (S1), and grey fox. The exact locations of these species are not disclosed by the MNR, but the general locations are provided in the form of a 1 x 1 km square and are provided in **Figure 4.1 (Appendix A)**. Correspondence with Todd Norris of the Kingston Area office of the MNR (2006a) confirms that these rare species accounts should be considered current where potential habitat exists.

Other rare species listed in **Table 4.3 (Appendix B)** are considered potentially present in the study area, either because they have ranges that extend across the study area, or have been observed on Wolfe Island (outside the Project study area).

A review of the Ontario Herpetofaunal Summary Atlas (Oldham and Weller, 2001) indicates that the ranges of several rare reptile species are known to overlap portions of the study area. These reptile species include the map turtle, eastern milksnake, black rat snake, Blanding's turtle, northern ribbonsnake, and common musk turtle. The Atlas indicates that no rare species of amphibians occur within the study area. The NHIC database does not contain any records of rare reptile or amphibian species within the study area, however, Stantec staff observed a live Blanding's turtle within the Big Sandy Bay Wetland on May 23, 2007. Additionally, a single road-killed black rat snake was observed by Stantec in the study area, on Highway 96 east of Concession 5, on September 18, 2007.

The Atlas of the Mammals of Ontario (Dobbyn, 1994) indicates that the study area does not overlap the known ranges of any rare mammals, however, the NHIC database lists a single occurrence of the grey fox on Wolfe Island (outside the Project study area) from 1979. This species is described as a potentially breeding migrant or vagrant in Ontario. The NHIC database states that there is very little evidence that this species breeds on a regular basis in the province, and there is only one documented instance of breeding (on Pelee Island).

A review of the Ontario Breeding Bird Atlas (BSC, 2005) and Christmas Bird Count results (National Audubon Society, 2006) was undertaken in order to identify further accounts of rare avian species in the vicinity of the study area, beyond those in the NHIC database. It should be noted that information provided by these sources are not location-specific, so it is possible that the species listed may not be present in the Project study area. A total of eight additional rare avian species records were found in these two sources for the general vicinity of the study area, and are Caspian Tern, Wilson's Phalarope (*Phalaropus tricolor)* (S3)*,* Great Black-backed Gull (*Larus marinus) (S2)* , Red-headed Woodpecker (*Melanerpes erythrocephalus)* (S3), Northern Bobwhite (*Colinus virginianus)* (S1S2), Short-eared Owl (*Asio flammeus*), Bald Eagle (*Haliaeetus leucocephalus)* (S4) and Golden Eagle (*Aquila chrysaetos)* (S1).

Wetland evaluation records for wetlands in the study area, obtained from the MNR, also contain accounts of rare species. A total of six additional rare species were identified from these records. These species are grass-leaved water-plantain, Short-billed Dowitcher, Hudsonian Godwit, Stilt Sandpiper, Canvasback and Redhead. Locations are discussed in **Section 4.1**.

Six fish species at risk, including pugnose shiner (*Notropis anogenus)*, bridle shiner (*N. bifrenatus)*, channel darter (*Percina copelandi)*, lake sturgeon (*Acipenser fulvescens),* cutlip minnow (*Exoglossum maxillingua)* and grass pickerel (*Esox americanus vermiculatus)*, have been recorded in the Upper St. Lawrence River, although no occurrence records containing these species was found for the immediate vicinity of the study area (MNR 2006a; LaPan et al., 2002).

Cutlips minnow is designated as a threatened species by COSSARO (MNR, 2006a), but not listed in regulation under the *Endangered Species Act*, whereas this species is considered to be not at risk by COSEWIC.

4.5.1 Plant Species at Risk

Two of the plant species in **Table 4.3 (Appendix B),** grass-leaved water-plantain and arrow arum, were identified in wetland evaluation records for Wolfe Island, and/or the NHIC database. Branching bur-reed is also a wetland species, but has not been recorded since 1897. Butternut (*Juglans cinerea*) (S3?), recently designated as federally and provincially Endangered, was observed during Stantec's field investigations.

Five butternut trees were identified in the southern portion of the mainland study area, in woodlands adjacent to the proposed underground transmission line route. Butternut is currently designated as Endangered, but is unregulated in Ontario therefore the *Ontario Endangered Species Act* does not apply. However, butternut is protected in Ontario by the Provincial Policy Statement (Government of Ontario, 2005) which prohibits development in significant habitat of endangered species and threatened species. Butternut has been recently designated Endangered because of wide-spread decline resulting from the fungus, *Sirococcus clavigignenti-juglandacearum,* commonly referred to as butternut canker. The locations of the butternut trees are shown on **Figure 4.2 (Appendix A),** and a summary of field observations for each tree is provided in **Table 4.4 (Appendix B).** These butternut trees will not be affected by transmission line construction or Project operations.

4.5.2 Bird Species at Risk

The King Rail, Least Bittern, and Henslow's Sparrow, and their identified habitats, are protected under the federal *Species At Risk Act* ("SARA"), regardless of whether they appear on government or private lands since each is a migratory bird. The King Rail and Henslow's Sparrow are also protected under the provincial *Endangered Species Act*, since they are listed as Endangered-Regulated at the provincial level, as are the Bald and Golden Eagles.

Least Bittern and Black Tern are probable breeding species in the coastal wetlands. King Rail also inhabits extensive marsh habitat, however, this species is exceedingly rare and has not been observed in the vicinity for over 50 years. Black-crowned Night-heron, Short-billed Dowitcher, Caspian Tern, Hudsonian Godwit, Stilt Sandpiper, Canvasback and Redhead are all birds that utilize the wetlands, primarily during migration, although Black-crowned Night-heron

and Caspian Tern may breed nearby and forage within the study area during the breeding season.

Short-eared Owl (*Asio flammeus)* (S3S4)*,* Red-headed Woodpecker and Henslow's Sparrow are potential breeding species that inhabit open field or pasture habitat. The remaining species, Northern Bobwhite*,* Bald Eagle*,* Golden Eagle and Wilson's Phalarope have only been observed during the winter.

A detailed discussion of potential breeding or wintering bird Species at Risk is provided in **Technical Appendix C5 – Bird Report**.

4.5.3 Mammal Species at Risk

The NHIC database lists a single occurrence of the grey fox on Wolfe Island (outside the Project study area) from 1979. This species is described as a potentially breeding migrant or vagrant in Ontario. The NHIC database states that there is very little evidence that the species breeds on a regular basis in the province

4.5.4 Reptile and Amphibian Species at Risk

The common musk turtle is strongly aquatic, and may utilize virtually any permanent, freshwater aquatic habitats. Areas with slow current and soft bottom are much preferred by this turtle. The common musk turtle has been known to climb and bask on tree limbs well above water. They hibernate in bottom mud or debris, under rocks, or in holes in banks, and may congregate when hibernating. Eggs are laid up to about 50m from water in soil; under logs, stumps, and vegetable debris; and in walls of muskrat houses; sometimes on open ground. Areas within the study area with potential habitat for musk turtles are limited, as most of the watercourses are strongly influenced by agriculture. Further, no record of this species was identified within the study area by the Natural Heritage Information Centre (MNR, 2005).

The Blanding's turtle is essentially aquatic, but often ventures onto land nearby to marshes, bogs, lakes and small streams. As with the common musk turtle, the Blanding's turtle over-winters in under-water substrates and nests on land where sandy soils are present. This species will also often utilize sites disturbed by human activity, such as agriculture, for nesting. These turtles have been known to occupy Great Lakes coastal wetlands. Most aquatic and wetland habitats within the study area could potentially support this species. Stantec staff observed a live Blanding's turtle within the Big Sandy Bay Wetland on May 23, 2007.

Map turtles utilize a wide range of aquatic habitats, but prefer large bodies of water, such as rivers or lakes. Hibernation in this species occurs very late in the season, occasionally after ice has formed on the water surface. Within the study area, the mouths of larger watercourses associated with the wetlands on the periphery of Wolfe Island likely represent the best potential habitat for this species.

The eastern milksnake and black rat snake both will utilize a wide range of habitats, including fields, woodlands, rocky hillsides, and river bottoms. Both species are known to utilize man-made structures for hibernation and hiding. These species could be found in virtually any habitat within the study area. A road-killed black rat snake was observed by Stantec on Highway 96 east of Concession 5, on September 18, 2007. Additionally, the northern ribbonsnake is most often found near aquatic habitats such as marshes, lakes, and streams.

4.5.5 Fish Species at Risk

The pugnose shiner, bridle shiner, channel darter, lake sturgeon, cutlip minnow and grass pickerel are all protected under SARA. Information acquired from CRCA and MNR (CRCA, 2006, MNR, 2006a) does not indicate the presence of fish species at risk in the West Branch of the Little Cataraqui Creek. A fisheries survey and aquatic habitat assessment at the proposed crossing location of this watercourse was conducted in the June of 2007. No species at risk were captured during this sampling program.

This page left blank intentionally.

5.0 Conclusions

5.1 WOLFE ISLAND

The Wolfe Island study area is a landscape demonstrating characteristics of anthropogenic influences. Land use is primarily agricultural and rural. Natural vegetation communities are limited to meadows, thickets and woodlands of cultural origins, with localized deciduous and mixed forest, and deciduous and thicket swamps. Natural communities with the highest ecological value in the study area are the wetland areas that are present along much of the Wolfe Island shoreline.

The Wolfe Island wetlands support the majority of the rare species observed, or that may potentially occur within the study area, including plant, avian, reptile, and fish species. A single rare mammal species, the grey fox, was observed in the study area on one occasion. This species is unlikely to be found in the study area presently or in the future, as it is generally considered to be a non-breeding vagrant in the province.

The majority of wildlife movement is likely to occur through the open agricultural fields. Several hedgerows with the potential to provide wildlife habitat and/or corridor functions were identified.

Aquatic habitats on Wolfe Island include intermittent, open channel drainage swales and intermittent and/or permanent creeks and ponds, as well as a single man-made canal linking Barrett and Bayfield Bays (Lake Ontario Waterkeeper, 2006). All watercourses on the island are classified as warmwater. The majority of the aquatic habitat on the island is degraded and highly intermittent in nature, leading to a DFO fish habitat classification of Marginal (formerly Type 3). The lower reaches of the larger creeks of the island provide the main body of permanent fish habitat, due for the most part to the intermittent nature and associated poor habitat quality of the upper reaches.

5.2 KINGSTON MAINLAND

Vegetation communities in the mainland study area have cultural origins. A Ducks Unlimited Canada (“DUC”) wetland and upland conservation project was undertaken on Frontenac Institution land and involved restoring the historical hydrology of the area. The restored wetlands are providing a highly productive and diverse habitat for many forms of wildlife. Most rare species noted in the mainland study area are associated with wetland communities of the Little Cataraqui Creek and will be unaffected by the Project. One Endangered species, butternut, is well outside the proposed transmission line route and will remain unaffected by the Project.

On the mainland, the Little Cataraqui Creek, including the West Branch that runs through the study area, does not contain any limiting fish habitat types. Both features are warmwater, shallow systems.

STANTEC CONSULTING LTD

Gwendolyn Weeks, B.Sc.

Valerie Wyatt, M.Sc.

6.0 Literature Cited

Acres International. 2005. Internal Draft Environmental Impact Statement / Environmental Screening for the Wolfe Island Wind Project.

Andreassen, H.P., S. Halle, and R.A. Ims. 1996. Optimal width of movement corridors for root voles: not too narrow, not too wide. Journal of Applied Ecology 33: 63-70.

Associate Committee on the National Building Code (ACNBC). 1980. The Supplement to the National Building Code of Canada. National Research Council of Canada, NRCC No. 17714: 293 p.

ARDA. 1964. Canada Land Inventory (CLI) for Agriculture Manuscript Mapping (Sheet 31 C/1). Scale 1:50 000.

Barnett, P.J. 1992. Quaternary geology of Ontario, pp. 1011-1088. In: P.C. Thurston, H.R. Williams, R.H. Williams, R.H. Sutcliffe and G.M. Stott [Eds.]. Geology of Ontario. Ontario Geological Survey, Special Volume 4, Part 2.

Beier, P. and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 13: 1241-1252.

Bennett, A.F. 1990. Habitat corridors and the conservation of small mammals in a fragmented forest environment. Landscape Ecology 4:109-122.

Bennett, A.F., K. Henein and G. Merriam. 1994. Corridor use and the elements of corridor quality: chipmunks and fencerows in a farmland mosaic. Biological Conservation 68: 155-165.

Bird Studies Canada (BSC). 2005. Ontario Breeding Bird Atlas; Square Summary Information.

Bonta, C., Bree, D., Critchley, S., Crowder, A., Grigg, S.E., Ripley, B., Snetsinger, M.A., Stewart, R.B., Weir, R.D., White, D.J. 2004. Report on Little Cataraqui Creek Wetland, West Side, Front Road to Bath Road. Kingston Field Naturalists.

Boysen, B. 2005. Forest Gene Conservation Association. Personal Communication to Al Sandilands, October 3, 2005.

Cataraqui and Region Conservation Authority (CRCA). 2006. Personal correspondence and data collection.

Chapman, L.J. and D.F. Putnam. 1984. The Physiography of Southern Ontario (Third Edition). Ministry of Natural Resources.

Clark Consulting Services. 2003. Township of Frontenac Islands Official Plan.

COSEWIC. 2003. COSEWIC assessment and status report on the butternut *Juglans cinerea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vii + 32pp. (www.sararegistry.gc.ca/status/status_e.cfm)

Dawson. 1994. Are habitat corridors conduits for animals and plants in a fragmented landscape? A review of the scientific evidence. English Nature Research Reports 94 1994: 1-89

Department of Fisheries and Oceans (DFO). Personal correspondence. Richard van Ingen, Fish Habitat Biologist, Eastern Ontario District - Prescott Office. July 11, 2006.

Department of Fisheries and Oceans (DFO). 1999. Sampling Protocol: A simple method to determine the thermal stability of southern Ontario streams.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Ducks Unlimited. 2006. Personal communication with Ron Mahar (Manager, Field Operations), February 10, 2006.

Ducks Unlimited. 2007. Personal communication with Owen Steele, September 10, 2007.

Environment Canada. 2004. Canadian Climate Normals (Online). Available: http://www.climate.weatheroffice.ec.gc.ca/climate_normals. Accessed: February 9, 2006.

Freeman, E.B. [Ed.]. 1978. Geological Highway Map, Southern Ontario. Ontario Geological Survey Map 2418.

Gillespie, J. E., Wicklund, R.E., and B.C. Matthews. 1966. The Soils of Frontenac County. Report No. 39 of the Ontario Soil Survey.

Government of Ontario. 2005. Provincial Policy Statement.

Haas, C.A. 1995. Dispersal and use of corridors by birds in wooded patches on an agricultural landscape. Conservation Biology 9: 845-854.

Haddad, N.M. 1999. Corridor use predicted from behaviors at habitat boundaries. American Naturalist 153: 215-227.

Lake Ontario Waterkeeper (LOW). 2006. Wolfe Island Wetland Corridor: Final Study Report.

Lee, H.T., Bakowsky, W.D., Riley, J., Bowles, J., Puddister, M., Uhlig, M., McMurray, S. 1998. Ecological Land Classification for Southern Ontario: First Approximation and It's

Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

LaPan, S.R., A. Mathers, T.J. Stewart, R.E. Lange, S.D. Orsatti, 2002. Fish-community objectives for the St. Lawrence River. Great Lakes Fish. Comm. Spec. Pub. 2002.

Major, R.E., F.J. Christie, G. Gowing and T.J. Ivison. 1999. Elevated rates of predation on artificial nests in linear strips of habitat. Journal of Field Ornithology 70: 351-364.

McIntyre, P., Sine, P. 1986. Summary of Evaluation Results: Browns Bay Wetland.

Ministry of Agriculture and Food (OMAF). 1983. Artificial Drainage Systems. Frontenac County, Wolfe Island Township. 1:25, 000. Revised 1998.

Ministry of the Environment (MOE). 2005. Air Quality Index Results: Kingston Ontario (Online). Available: http://www.airqualityontario.com/reports/. Accessed: February 9, 2006.

Ministry of the Environment (MOE). 2006. Water Well Data for Kingston and Wolfe Island.

Ministry of the Environment (MOE). 1974. Water Well Records for Ontario – Frontenac, Lanark, 1946 – 1969. Ministry of Environment, Water Resources Bulletin 2-15, Groundwater Series.

Ministry of Municipal Affairs and Housing (MMAH). 2005. Ontario Building Code.

Ministry of Natural Resources. 1986a. Wolfe Island Wetland Complex Wetland Data and Scoring Record.

Ministry of Natural Resources. 1986b. Wetland Data Record: Big Sandy Bay.

Ministry of Natural Resources. 1986c. Wetland Data Record: Sand Bay Wetland.

Ministry of Natural Resources. 1986d. Wetland Data Record: Reeds Bay Wetland.

Ministry of Natural Resources. 1986e. Wetland Data Record: Button Bay Wetland.

Ministry of Natural Resources. 1986f.. Wetland Data Record: Bayfield Bay Marsh.

Ministry of Natural Resources. 1986g. Wetland Data Record: Barrett Bay Wetland.

Ministry of Natural Resources. 2000. Significant Wildlife Habitat Technical Guide.

Ministry of Natural Resources. 2004. Southern Ontario Wetland Evaluation, Scoring Summary Record: Little Cataraqui Creek Complex.

Ministry of Natural Resources, Peterborough District. 2006a. Personal correspondence with Todd Norris, and general data collection.

Ministry of Natural Resources 2006b. Draft Guidelines to Assist MNR Staff in the Review of Wind Power Proposals in or Near Water: Potential Impacts to Fisheries, October 2006.

National Audubon Society. 2006. The Christmas Bird Count Historical Results [Online]. www.audubon/bird/cbc. Accessed November 21, 2006.

Natural Heritage Information Centre (NHIC) Database (Online). 2007. Accessed: January 4, 2007. Available: http://nhic.mnr.gov.on.ca/nhic.cfm

Natural Resources Canada. 2003. Seismic Hazard Design Values (Online). Available: http://www.earthquakescanada.nrcan.gc.ca/hazards/OF4459/of4459table1_e.php. Accessed: February 15, 2006.

Oldham, M.J. and W.F. Weller. 2001. Ontario Herpetofaunal Atlas internet database. Natural Heritage Information Centre, Ministry of Natural Resources. Accessed February, 2006. http://www.mnr.gov.on.ca/MNR/nhic/herps/ohs.html

Rosenberg, D.K., B.R. Noon, E.C. Meslow. 1997. Biological corridors: Form, function, and efficacy. BioScience 47: 677-687..

Rowe, J.S. 1972. Forest Regions of Canada. Ottawa, Canadian Forest Service. Pub. No. 1300. 172 pp.

Sandilands, A. P. 2007. Personal Communication.

Sauer, J.D. 1998. Plant migration: the dynamics of geographic patterning in seed plant species. University of California Press. 282 pp.

Simberloff, D., J.A. Farr, J. Cox, and D.W. Mehlman. 1992. Movement corridors: conservation bargains or poor investments? Conservation Biology 6: 493-504.

Stantec Consulting Ltd. 2005a. Winter Raptor and Spring Migration Surveys Report: Wolfe Island Wind Project.

Stantec Consulting Ltd. 2005b. Bat Surveys Report: Wolfe Island Wind Project.

Stantec Consulting Ltd. 2007a. Butterfly Report: Wolfe Island Wind Project.

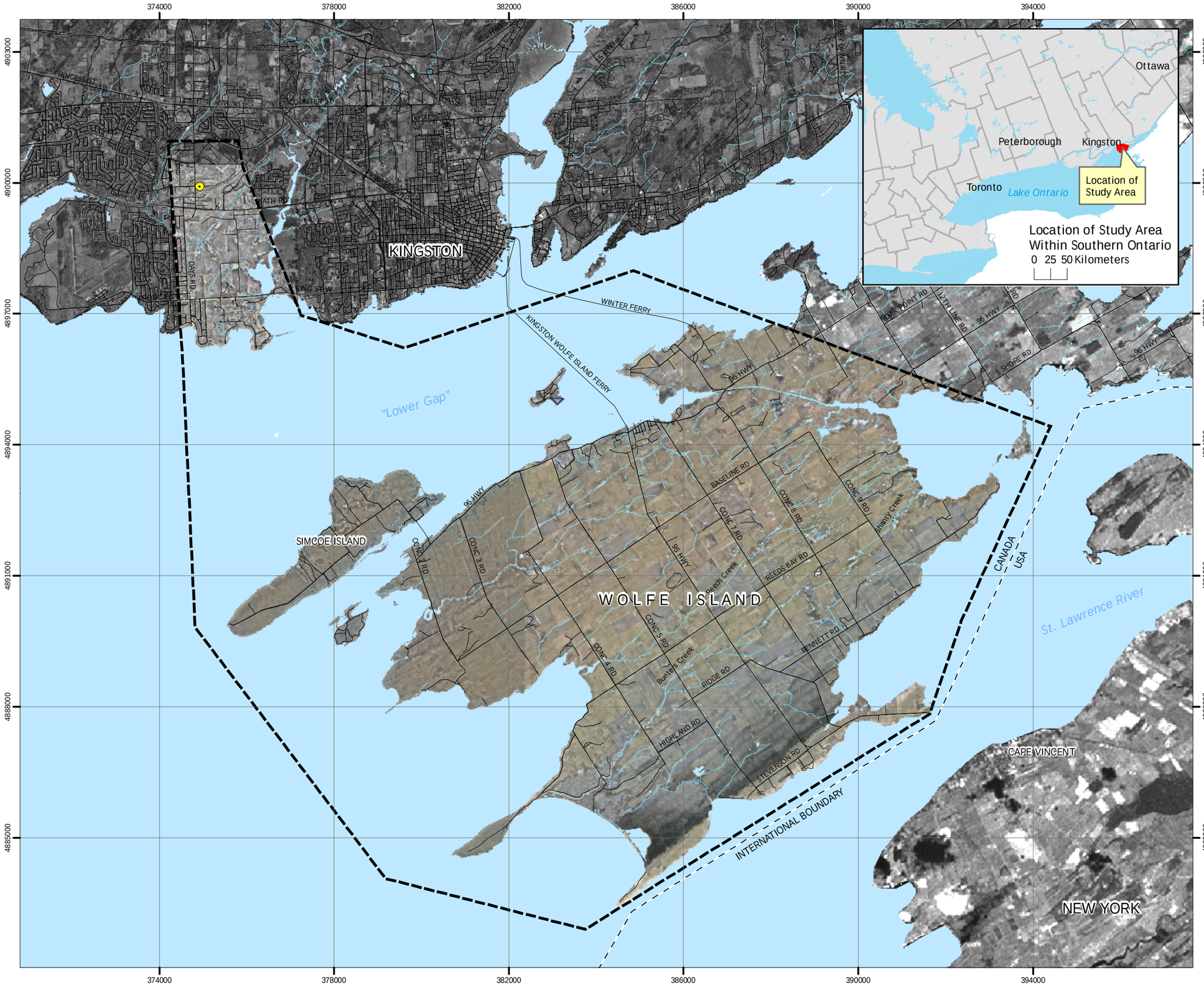
Stantec Consulting Ltd. 2007b. Herpetile Report: Wolfe Island Wind Project.

Stringer's Environmental Services and AsiOtus Natural Heritage Consultants. 2005. Restoration and Enhancement of the Fish and Wildlife Habitat of the Wolfe Island Canal. Prepared for Wolfe Island Wildlife Association and Lake Ontario Waterkeeper, January 2005.

Township of Frontenac Islands. 2003. Modification No. 7 to the Official Plan Approval of July 2003.

Appendix A

Figures



CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 1 2 Kilometers

N
W E
S

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air Photos: LIDAR (study area coverage), January 2006.
LANDSAT7 (U.S. coverage), 1999.
City of Kingston (city coverage), 2005.

Legend

- Study Area
- Gardiners Transformer Station

WOLFE ISLAND WIND PROJECT PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

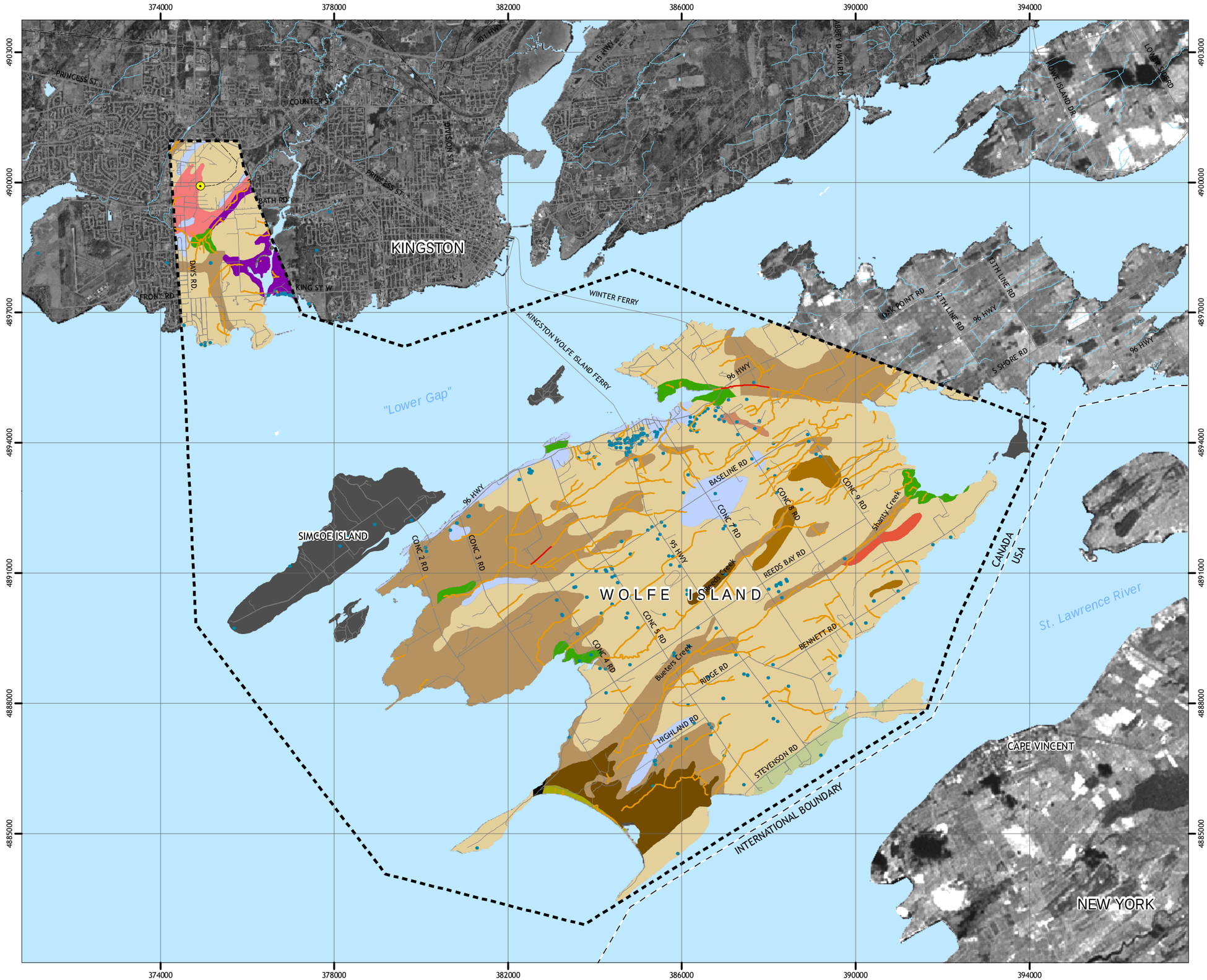
FIGURE NO.
1.1

Project Location and Study Area

FILE:	PROJECT NUMBER
60960056_C7_02_project_location.mxd	60960056

REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
0	1 OF 1	1:85,000	AM

September, 2007



CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 1 2 Kilometers

N W E S

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air photos: LIDAR (Study area coverage), January 2006. LANDSAT (US coverage), 1999. City of Kingston (City coverage), 2005.

Soil data: OMAFRA Soils of Ontario data set, 2005.

Water well locations: MOE, 2006.

Water quality sampling stations: MOE, 2006.

Natural drainage features: MNR, 2006.

- Study Area
- Gardiners Transformer Station

Soil Series / CLI Soil Capability for Agriculture Classifications

- Farmington (Fl) loam / 6r
- Eastport (Es) sand / 7e
- Lansdowne (Lac) clay / 2d
- Lansdowne - shallow phase (Lac-sh) clay / 4r
- Lindsay (Lc) clay / 2w
- Lindsay loam (Lcl) clay / 2w
- Napanee (Nc) clay / 3w
- Napanee - shallow phase (Nc-sh) clay / 4r,w
- Newburgh (Nufsl) fine sandy loam / 2t
- Marsh (Ma) /7w
- Peat (P) / O
- Rock Outcrop (R.O.) / 7r
- Muck (M) / O
- Not Mapped
- Water Well
- Warm water streams
- Unevaluated Streams

WOLFE ISLAND WIND PROJECT PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

2.1

Soil Classifications, Water Wells, and Natural Drainage Features

FILE: 60960056_C7_01_soils.mxd

PROJECT NUMBER: 60960056

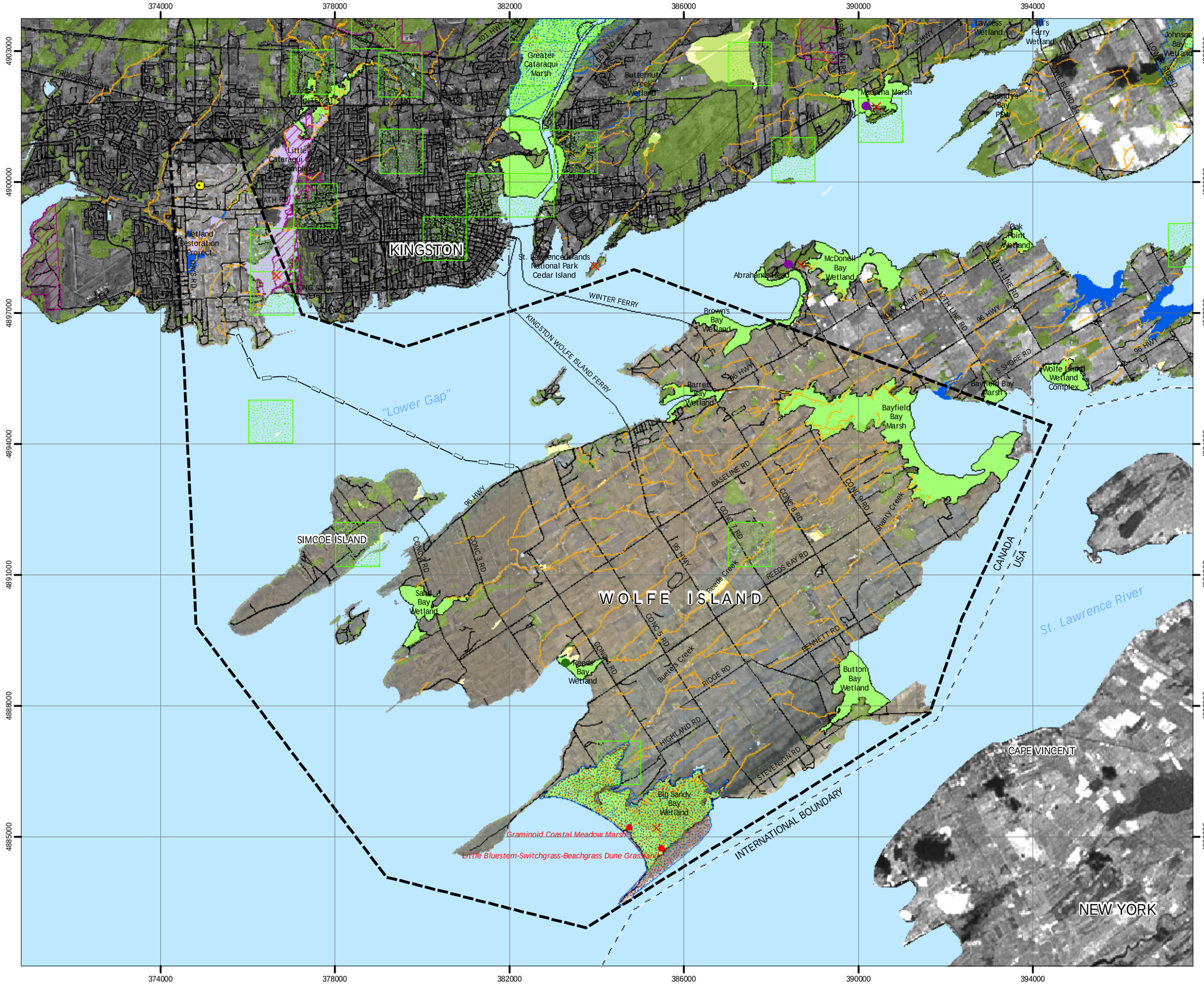
REV. NO.: 0

SHEET NO.: 1 OF 1

SCALE: 1:85,000

DRAWN BY: JLW

September, 2007



CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 1 2 Kilometers

N W E S

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air Photos: LIDAR (study area coverage), January 2006.
LANDSAT7 (U.S. coverage), 1999.
City of Kingston (city coverage), 2005.

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

Legend

- Study Area
- Gardiners Transformer Station

Area of Natural or Scientific Interest (ANSI)
- Earth
- Life

Wetlands
- Provincially significant wetland
- Non-provincially significant wetland
- Unevaluated wetland

Other Natural Areas
- Earth Science Site
- International Biological Program Site
- Life Science Site
- Vegetation Communities
- Warm Water Streams
- Cataraqui Region Conservation Authority Lands
- Rare Species Occurrence
- Ducks Unlimited Project Location
- Woodlot

WOLFE ISLAND WIND PROJECT PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.
4.1

Natural Environment Features

FILE:	PROJECT NUMBER
60960056_C7_05_natural_environment.mxd	60960056

REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
0	1 OF 1	1:85,000	JLW

October, 2007

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air photos: LIDAR (Study area coverage), January 2006. LANDSAT (US coverage), 1999. City of Kingston (City coverage), 2005.

CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 100 200 Meters

N
W E
S

Butternuts

Vegetation Communities

VEGETATION COMMUNITY

Deciduous Forest (FOD)
- FOD — Deciduous Forest
- FOD7 — Fresh-Moist Lowland Deciduous Forest
- FOD4-2 — Dry-Fresh White Ash Deciduous Forest

Cultural Meadow (CUM)
- CUM1-1 — Old-field Cultural Meadow

Cultural Thicket (CUT)
- CUT1-4 — Gray Dogwood Cultural Thicket

Cultural Woodlot (CUW)
- CUW1-6* — Mixed Cultural Woodland
- CUW1-7* — White Ash Cultural Woodland

Meadow Marsh (MAM)
- MAM2-1 — Bluejoint Mineral Meadow Marsh
- MAM2-2 — Reed Canary Grass Mineral Meadow Marsh
- MAM2-6 — Broad-leaved Sedge Mineral Meadow Marsh

Shallow Marsh (MAS)
- MAS2-1 — Cattail Mineral Shallow Marsh
- MAS2-10* — Bluejoint Mineral Shallow Marsh

OA — Open Aquatic (OA)

OTHER DESIGNATIONS
- RES — Residential
- INDUS — Industrial
- INST — Institutional
- COM — Commercial
- Lawn — Mowed Lawn
- AG — Agricultural
- PAS — Pasture
- HR — Hedgerow
- PAR — Park

*Indicates communities not included in the guide Ecological Land Classification for Southern Ontario – First Approximation and Its Application (SCSS Field Guide FG-02).

WOLFE ISLAND WIND PROJECT PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

4.2

Vegetation Communities: Kingston Mainland

FILE:	PROJECT NUMBER
60960056_C7_03_mainland_elc.mxd	60960056

REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
1	1 of 1	1:10,000	JLW

September, 2007

382060.553635 | 382460.553635 | 382860.553635 | 383260.553635 | 383660.553635

CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 100 200 Meters

N W E S

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air photos: LIDAR (Study area coverage), January 2006. LANDSAT (US coverage), 1999. City of Kingston (City coverage), 2005.

WOLFE ISLAND WIND PROJECT
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

4.3

Vegetation Communities: Wolfe Island, Northwest Key Portions of Study Area

FILE:	PROJECT NUMBER
60960056_C7_04_wolfe_island_elc.mxd	60960056

REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
0	1 of 1	1:8,000	JLW

September, 2007

4894431.398769 | 4893731.398769 | 4893031.398769 | 4892331.398769

COT
COT
COT
FO
FOD7-3
SWT2-4
SWT2-4
MAM2-11*
MAS2-1
MAM2-1
MAM2-11*
FOD7-3
CUT2
FOM7-3*
CUT2
CUT2
CULT
FOD
LAWN/RES
CUM1-1
RES
CUW1-4*
LAWN
RES
INDUS
CUM1-1
LAWN
CUM1-1
AG
CUM1-1
LAWN
CUM1-1
MAS2-1
CUM1-1 OA
MAS2-1
AG

Vegetation Communities

VEGETATION COMMUNITIES

Mixed Forest (FOM)
- FOM7-3* Fresh-Moist White-Cedar - Ash - Elm Mixed Forest

Deciduous Forest (FOD)
- FOD Deciduous Forest
- FOD7-3 Fresh-Moist Willow Lowland Deciduous Forest
- FOD7-6* Fresh-Moist Ash-Elm Lowland Deciduous Forest

Cultural Meadow (CUM)
- CUM1-1 Old-field Cultural Meadow

Cultural Thicket (CUT)
- CUT1-4 Gray Dogwood Cultural Thicket
- CUT2 Bedrock Cultural Thicket

Cultural Woodland (CUW)
- CUW1-3* Manitoba Maple Cultural Woodland
- CUW1-4* Elm - Willow - White Cedar Cultural Woodland
- CUW1-5* Manitoba Maple - Black Locust Cultural Thicket

Thicket Swamp (SWT)
- SWT2-4 Buttonbush Mineral Thicket Swamp

Meadow Marsh (MAM)
- MAM2-1 Bluejoint Mineral Meadow Marsh
- MAM2-2 Reed Canary Grass Mineral Meadow Marsh
- MAM2-6 Broad-leaved Sedge Mineral Meadow Marsh
- MAM2-11* Forb-Graminoid Mineral Meadow Marsh

Shallow Marsh (MAS)
- MAS2-1 Cattail Mineral Shallow Marsh

- OA Open Aquatic (OA)

OTHER DESIGNATIONS
- COT Cottages
- RES Residential
- INDUS Industrial
- INST Institutional
- COMM Commercial
- Lawn Mowed Lawn
- AG Agricultural
- PAS Pasture
- HR Hedgerow

382060.553635 | 382460.553635 | 382860.553635 | 383260.553635 | 383660.553635

CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 50 100 Meters

N

Notes:
Base map layers: MNR Land Information Distribution Service (LIDS).

Air Photos: LIDAR (study area coverage), January 2006.
LANDSAT7 (U.S. coverage), 1999.
City of Kingston (city coverage), 2005.

Legend

- Intermittent Drainage Feature
- Seasonal Watercourse
- Vegetation Communities

FOD	Deciduous Forest
FOD7-7*	Fresh-moist White Ash Deciduous Forest
CUT1-7*	Hawthorn-Dogwood Cultural Thicket
CUM1-1	Old-Field Cultural Meadow
MAM2-2 / MAM2-6	Reed Canary Grass / Broad-leaved Sedge Mineral Meadow Marsh
RES	Residential
PAS	Pastural
HR	Hedgerow
AG	Agricultural
DP	Dug Pond
DIS	Disturbed

WOLFE ISLAND WIND PROJECT
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

4.4

Vegetation Communities: Wolfe Island, North Central Key Portions of Study Area

FILE: 60960056_C7_08_northcentral_elc.mxd

PROJECT NUMBER: 60960056

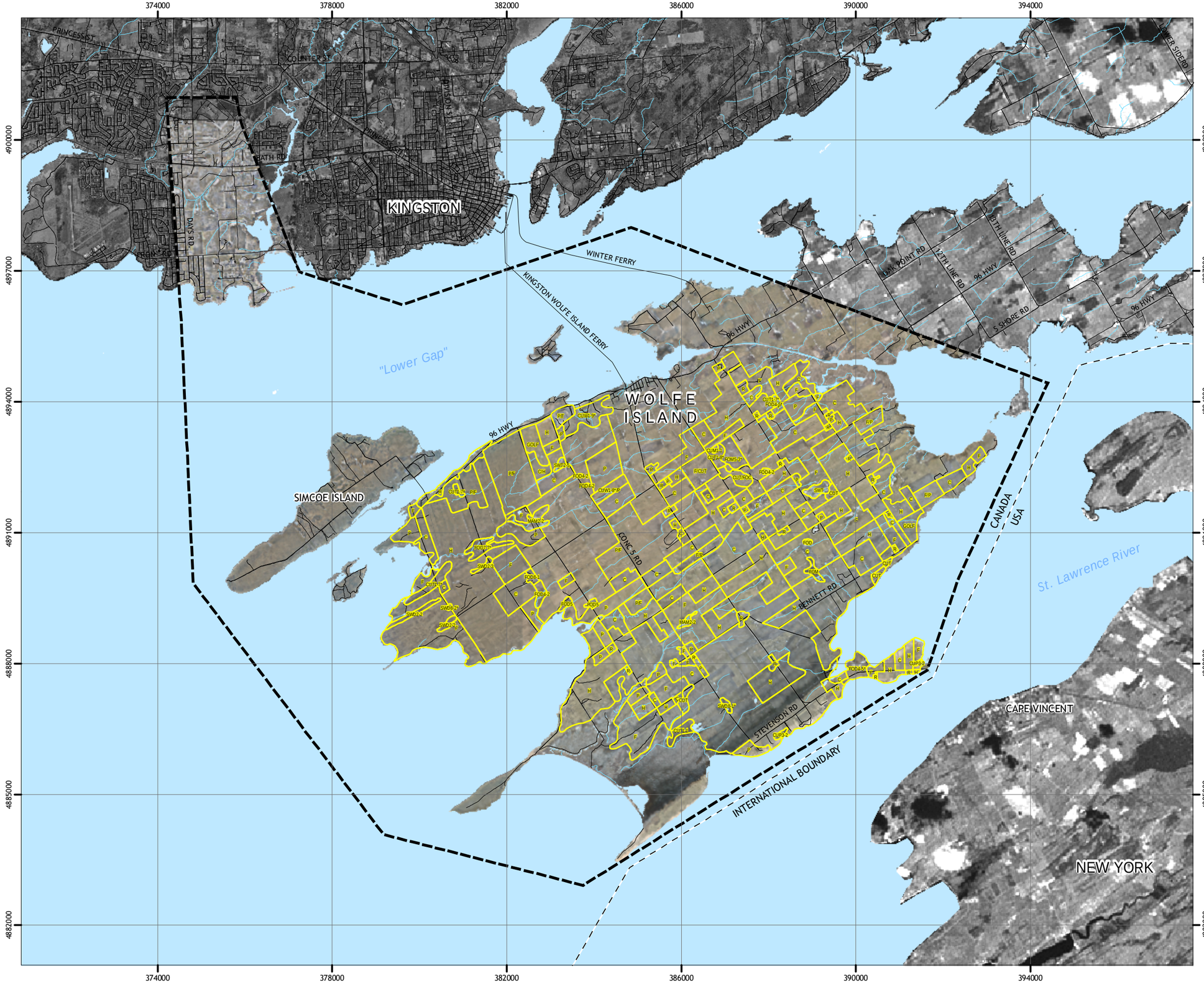
REV. NO.: 0

SHEET NO.: 1 OF 1

SCALE: 1:3,500

DRAWN BY: JLW

October, 2007



CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 1 2 Kilometers

N
W E
S

ELC Legend - Wolfe Island Habitat Mapping

Coniferous Forest (FOC)
FOC1-2 - White Pine Coniferous Forest

Mixed Forest (FOM)
FOM - Mixed Forest
FOM5-3* - White Ash - White Pine Mixed Forest

Deciduous Forest (FOD)
FOD - Deciduous Forest
FOD4-2 - Dry-fresh White Ash Deciduous Forest
FOD4-4* - White Ash - Hickory Deciduous Forest
FOD4-5* - White Ash - Oak Deciduous Forest
FOD5 - Dry-fresh Sugar Maple Deciduous Forrest
FOD7-7* - White Ash Deciduous Forest
FOD8-1 - Fresh-moist Poplar Deciduous Forest Type

Cultural Plantation (CUP)
CUP3-2 - White Pine Coniferous Plantation

Cultural Meadow (CUM)
CUM1-1 - Dry-moist Old Field Meadow

Cultural Thicket (CUT)
CUT - Cultural Thicket
CUT1-1 - Sumac Cultural Thicket
CUT1-7* - Hawthorn - Dogwood Cultural Thicket
CUT1-8* - Sumac - Juniper - Dogwood Cultural Thicket

Cultural Woodland (CUW)
CUW1-8* - White Elm Cultural Woodland

Deciduous Swamp (SWD)
SWD - Deciduous Swamp
SWD2-2 - Green Ash Mineral Deciduous Swamp
SWD8-1* - Poplar Mineral Deciduous Swamp
SWD8-2* - Silver Maple Mineral Deciduous Swamp

Swamp Thicket (SWT)
SWT2-5 - Red-osier Mineral Thicket Swamp

Meadow Marsh (MAM)
MAM2-2 - Reed-canary Grass Mineral Meadow Marsh

Shallow Marsh (MAS)
MAS - Shallow Marsh
MAS2-1 - Cattail Mineral Shallow Marsh

Agricultural Designations:
C - Crops (Row)
H - Hay
F - Fallow
P - Pasture

Other Designations:
R - Residential
Golf - Golf Recreational
Pit - Pit Extraction Area

Legend

Vegetation Communities

Study Area

WOLFE ISLAND WIND PROJECT PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

4.5

Vegetation Communities

FILE:			PROJECT NUMBER
60960056_C7_06_elc.mxd			60960056
REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
0	1 OF 1	1:85,000	JLW

October, 2007

CANADIAN HYDRO DEVELOPERS, INC.
through its wholly owned subsidiary
Canadian Renewable Energy Corporation

Stantec

0 1 2 Kilometers

N
W E
S

- Study Area
- Natural Vegetation Communities
- Area of Local Deer Movement

Wetlands
- Provincially significant wetland
- Non-provincially significant wetland
- Unevaluated wetland

Hedgerows
- Hedgerow of Low Significance
- Hedgerow with Sepcial Habitat Potential (i.e. mast value, nesting)
- Hedgerows Connecting Wildlife Habitat Patches

WOLFE ISLAND WIND PROJECT
PHYSICAL, ATMOSPHERIC AND NATURAL ENVIRONMENT BASELINE REPORT

FIGURE NO.

4.6

Wolfe Island Hedgerows and Wildlife Utility Areas

FILE:			PROJECT NUMBER
60960056_C7_07_hedgerow_wildlife.mxd			60960056
REV. NO.	SHEET NO.	SCALE:	DRAWN BY:
0	1 OF 1	1:85,000	JLW

October, 2007

Appendix B

Tables

Table 2.1 Spectral Hazard Values for the Kingston Area (NRCan, 2003)

Spectral Period	Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)
Spectral Hazard Value	0.30	0.16	0.084	0.024

NOTES: Sa = Spectral Acceleration, and the values shown in brackets (e.g., 1.0) represent the period in seconds.

Table 3.1 2005 Air Quality Index Summary

MOE Station ID	Location	Days in AQI Range				
		Very Good 0-15	Good 16-31	Moderate 32-49	Poor 50-99	Very Poor 100+
52020	Kingston	86	196	58	4	0

Table 4.1 ELC Vegetation Community Descriptions

Unit	Description
Forest (FO)	
Coniferous Forest (FOC)	
FOC1-2 White Pine Coniferous Forest	This forest community contained almost exclusively white pine in the canopy. Some white ash regeneration was noted in the lower layers.
Mixed Forest (FOM)	
FOM5-3* White Ash – White Pine Mixed Forest	This mature forest community contained white ash and white pine in the canopy, with a lesser representation of white spruce. Shrubs noted included red-osier dogwood, common buckthorn and juniper.
FOM7-3* Fresh-moist White Cedar – Ash – Elm Mixed Forest	This community was dominated by white cedar, with associates of ashes and white elm. The shrub layer consisted of staghorn sumac, lilac and riverbank grape, while the ground cover flora contained a mix of cultural meadow species.
Deciduous Forest (FOD)	
FOD Deciduous Forest	This community was comprised of a variety of deciduous tree species, with no species or group of species demonstrating a clear dominance. Species present in the canopy included hop hornbeam, white ash, white elm, white cedar, red ash, sugar maple, basswood and red oak. Shrub species noted were staghorn sumac, lilac, Japanese barberry and chokecherry.
FOD4-2 Dry-fresh White Ash	White ash dominated this community with small component of sugar maple and red pine. Several butternut trees were identified within

Table 4.1 ELC Vegetation Community Descriptions

Unit	Description
Deciduous Forest	this community. The understorey contained elderberry, honeysuckle and white ash samplings with a small amount of alternate-leaved dogwood. Garlic mustard dominated the ground layer.
FOD4-4* White Ash – Hickory Deciduous Forest	White ash and bitternut hickory dominated the canopy of this deciduous forest community. Some willows were also present, but in much lower numbers. The understory contained some red-osier dogwood.
FOD4-5* White Ash – Oak Deciduous Forest	White ash, oak, American beech and hop hornbeam trees were present in the canopy of this community. Understory species included saplings of these species, alternate-leaved dogwood, and chokecherry.
FOD5 Dry-fresh Sugar Maple Deciduous Forest	This community contained almost exclusively sugar maple in the canopy.
FOD7 Fresh-moist Lowland Deciduous Forest	Red ash, willow, silver maple, Manitoba maple, and black ash represented the dominant species within this community. Red-osier dogwood, various honeysuckles, purple-flowering raspberry and red raspberry were all dominant in the shrub layer. Ground-layer species included grasses and goldenrods. This community was found along the Wolfe Island and mainland shorelines, and was likely the result of past clearing and disturbance.
FOD7-3 Fresh-moist Willow Lowland Deciduous Forest	This community was similar to the FOD community described above in this table, however, there was a greater representation of willow species in comparison to other canopy species. In the lower levels, red raspberry, riverbank grape, jewelweed, Canada anemone, Virginia creeper, grasses and goldenrods were present.
FOD7-6* Fresh-moist Ash – Elm Lowland Deciduous Forest	Black ash and white elm dominated the canopy of this community. Thickets of grey dogwood and riverbank grape were present in the shrub layer, along with ash and elm saplings. Ground cover flora was dominated by grasses and goldenrods, with jewelweed and riverbank grape.
FOD7-7* Fresh-moist White Ash Deciduous Forest	This deciduous forest community contained exclusively white ash in the canopy. The understory was composed of hawthorns with some red-osier dogwood.
FOD8-1 Fresh-moist Poplar Deciduous Forest	This community contained trembling aspen in the canopy, with hawthorn and red-osier dogwood in the understory. The ground layer included some old-field species, including goldenrods.

Table 4.1 ELC Vegetation Community Descriptions

Unit	Description
Cultural (CU)	
Cultural Plantation (CUP)	
CUP3-2 White Pine Coniferous Plantation	This cultural plantation contained semi-mature white pine, with a very little diversity in the understory or ground-layer.
Cultural Meadow (CUM)	
CUM1-1 Dry-moist Old Field Meadow	This community represented areas that had undergone the initial stages of succession post-disturbance (including abandoned agricultural fields). Species present in these communities are often non-native, and included tufted vetch, birds-foot trefoil, clovers, wild carrot, dandelion, common plantain, chicory, thistles, and various grasses, goldenrods and asters.
Cultural Thicket (CUT)	
CUT2 Bedrock Cultural Thicket	This thicket community consisted of grey dogwood, lilac, staghorn sumac and common buckthorn over thin soils and open limestone bedrock. Species present in the understory included common cultural meadow species.
CUT1-1 Sumac Cultural Thicket	Staghorn sumac dominated the canopy of this cultural thicket. Also present were hawthorns and red-osier dogwood. Understory species included common old-field forbs and grasses.
CUT1-4 Grey Dogwood Cultural Thicket	Grey dogwood shrubs dominated this community, while few, scattered silver maples were present in the canopy. The density of the shrub layer did not allow for significant development of understory or ground layer species.
CUT1-7* Hawthorn – Dogwood Cultural Thicket	This thicket community was well represented throughout the study area. The canopy consisted of hawthorn trees, intermixed with grey dogwood. The understory was dominated by old-field species, including grasses and various common forbs.
CUT1-8* Sumac – Juniper – Dogwood Cultural Thicket	This cultural thicket was contained staghorn sumac, juniper, grey dogwood, and to a lesser extent, red-osier dogwood in the upper layers. The understory was dominated by old-field grasses and mixed herbaceous species.
Cultural Woodland (CUW)	
CUW1-3* Manitoba Maple Cultural Woodland	Manitoba maple was the dominant species in this community type, while common buckthorn was present among Manitoba maple saplings in the understory. Grasses and mixed herbaceous species dominated the ground layer.

Table 4.1 ELC Vegetation Community Descriptions

Unit	Description
CUW1-4* Elm – Willow – White Cedar Cultural Woodland	This community consisted of white elm, willow and white cedars in the canopy, while chokecherry and lilac dominated the understory. Grasses and mixed herbaceous species dominated the ground layer.
CUW1-5* Manitoba Maple – Black Locust Cultural Woodland	Black locust and Manitoba maple were dominant in the canopy of this community. Active grazing had eliminated any shrub layer, and cultural meadow species dominated the ground layer.
CUW1-6* Mixed Cultural Woodland	A cultural woodland with maintained trails. Co-dominance of many species including sugar maple, Norway spruce, yew, white birch, white ash, large-toothed aspen, black cherry and tamarack. A single butternut was located in this community. The understorey contained chokecherry and honeysuckle. Garlic mustard dominated the ground layer.
CUW1-7* White ash Cultural Woodland	White ash was the dominant species in this community, with components of Manitoba maple. Red raspberry, goldenrod and grasses were abundant in the ground layer. A narrow band of FOD7-3 (Fresh-moist Willow Lowland Deciduous Forest) ran through this community in a low lying ditch.
CUW1-8* White Elm Cultural Woodland	White elm dominated the canopy of this cultural woodland community. The understory included red-osier dogwood. Ground layer species included common old-field species, such as grasses and goldenrods.
Swamp (SW)	
Deciduous Swamp (SWD)	
SWD2-2 Green Ash Mineral Deciduous Swamp	This swamp community was dominated by green ash, as was the subcanopy. Understory species included grey and red-osier dogwoods. Cattails were present in several locations in the lower layers.
SWD8-1* Poplar Mineral Deciduous Swamp	This swamp community consisted mainly of poplar species (balsam poplar and trembling aspen) in the canopy. Shrub species included red-osier dogwood.
SWD8-2* European White Poplar Mineral Deciduous Swamp	European white poplar dominated the canopy of this deciduous swamp. Understory species included meadowsweet and grey dogwood.

Table 4.1 ELC Vegetation Community Descriptions

Unit	Description
Thicket Swamp (SWT)	
SWT2-4 Buttonbush Mineral Swamp Thicket	This swamp community was dominated almost exclusively by buttonbush in the canopy, with sparse representation of red-osier dogwood and cattails. Understory was sparse, given the density of the shrub layer, but included various sedges and spotted jewelweed.
SWT2-5 Red-osier Mineral Swamp Thicket	Grey dogwood and red-osier dogwood comprised the dominant vegetative cover in this community. Scattered green ash and white elm were present in the canopy. Grasses were present in the ground layers.
Marsh (MA)	
Meadow Marsh (MAM)	
MAM2-1 Bluejoint Mineral Meadow Marsh	Canada bluejoint dominated this wetland community, where reed canary grass and cattails were present also. Sedges and rushes were present, but in lower densities.
MAM2-2 Reed Canary Mineral Meadow Marsh	This community was dominated by reed canary grass, with other grasses, goldenrods and asters present in lower densities.
MAM2-6 Broad-leaved Sedge Mineral Meadow Marsh	This community occurred in two locations. Off Barrett's Bay the community was comprised almost exclusively of lakebank sedge, with occasional willow herb and bittersweet nightshade throughout. In the second location, near Highway 96 and Concession 7 Road, the community occurred in cattle pasture. It was dominated by a *Carex sp*., which had been heavily grazed by cattle.
MAM2-11* Forb - Graminoid Mineral Meadow Marsh	This community was dominated by asters, goldenrods, sedges and grasses. Also present were riverbank grape, mints, and some encroaching cultural meadow species, such as tufted vetch.
Shallow Marsh (MAS)	
MAS2-1 Cattail Mineral Shallow Marsh	Cattails, both broad and narrow-leaved, were exclusively dominant in this community. Very few other species were present, but included occasional bittersweet nightshade, and common reed grass along the edges of the community.
MAS2-10* Bluejoint Mineral Shallow Marsh	This community was present as an inclusion within a bluejoint mineral meadow marsh, where water was present at the surface during much of the year. Community composition was the same as MAM2-1.
Open Water (OA)	Open water communities within the study area consist of water bodies greater than 2m deep and having no macrophyte vegetation.

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
1	5	20		1	60	60		White Ash > White Oak	Connectivity
2	5	15	1	1	80	30	Hawthorn	White Oak	Special Habitat Potential (mast)
3	5	20		1	90	50	Hawthorn	White Ash > Red Oak	
4	5	15	1	1	90	15	Dogwood >> Hawthorn	White Oak	
5	5	10		1	80	10	Hawthorn	White Ash	
6	5	15		1	90	5	Dogwood > Hawthorn	White Oak	
7	5	15		1	100	30	Dogwood > Hawthorn	White Ash > Red Oak	
8	5	20		1	90	25	Hawthorn	Red Oak = White Ash	
9	5	15		1	50	50	Hawthorn	White Elm	
10	5	0	1	0	50	0	Dogwood > Hawthorn	N/A	
11	0	20	0	1	0	50	N/A	White Ash > Red Oak	
12	5	20		1	70	40	Dogwood	White Elm	
13	5	25		1	20	40	Hawthorn	White Ash	
14	5	15		1	5	30	Dogwood	White Ash	
15	5	20		2	20	80	Dogwood = Hawthorn	White Ash >> White Oak	Special Habitat Potential (mast)

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
16	5	20		1	50	60	Hawthorn	White Ash > White Elm = White Oak	
17	5	20		1	80	15	Hawthorn	White Ash	
18	5	15		1	95	10	Hawthorn	White Ash >> White Elm	
19	5	15	1	1	60	60	Hawthorn	White Ash	
20	5	15	1	1	80	50	Hawthorn	White Elm	
21	5	15		1	90	20	Hawthorn	White Ash	
22	5	0	2	0	95	0	Hawthorn	N/A	Special Habitat Potential (nesting)
23	5	10		1	60	20	Hawthorn	White Ash	
24	5	15		1	30	40	Hawthorn	White Ash	
25	5	10	1	1	5	80	Hawthorn	White Ash	
26	5	15	1	1	50	50	Hawthorn	White Ash = White Oak	Connectivity
27	0	15	0	1	0	40	N/A	White Ash	
28	5	15	1	1	40	60	Hawthorn	White Ash > White Oak	
29	5	15	1	1	70	60	Dogwood > Hawthorn	White Oak > White Ash	Special Habitat Potential (mast)
30	5	15		1	60	40	Dogwood > Hawthorn	White Oak > White Ash	Special Habitat

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
									Potential (mast)
31	5	20		1	80	40	Dogwood	White Ash	
32	5	15		1	80	20	Dogwood	White Ash	Connectivity
33	5	20		1	50	30	Dogwood > Hawthorn	White Elm > White Ash	
34	5	15		1	60	50	Hawthorn	White Ash > White Oak	
35	5	20	1	1	40	70	Hawthorn	White Ash	
36	5	20		2	40	80	Hawthorn	White Ash	
37	5	15		1	20	80	Hawthorn	White Elm > White Ash	
38	5	15		1	20	30	Hawthorn	Red Oak	Special Habitat Potential (mast)
39	3	0		0	70	0	Dogwood	N/A	
40	5	25		1	50	20	Dogwood	White Ash = White Oak	
41	5	15		1	50	40	Dogwood	White Elm	
42	5	0		0	50	0	Dogwood	N/A	
44	5	20		1	70	60	Dogwood > Hawthorn	White Ash >> White Elm	Connectivity
45	5	20		1	40	50	Hawthorn > Dogwood	White Ash	
46	5	15		1	50	40	Dogwood	White Ash	

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
47	5	15		1	70	20	Dogwood = Hawthorn	White Ash > White Elm	
48	5	15		1	30	10	Dogwood	White Elm	
49	5	10	1	1	40	5	Hawthorn = Dogwood	White Ash	
50	5	10	1	1	80	30	Dogwood > Hawthorn	White Elm	
51	5	10		1	90	5	Dogwood = Hawthorn	White Elm	Connectivity
52	5	20		1	10	60	Hawthorn	White Oak > White Elm	Special Habitat Potential (mast)
53	5	20		1	30	40	Dogwood	White Ash > White Elm	
54	5	15		1	30	30	Dogwood >> Hawthorn	White Ash	
55	5	10	1	1	40	10	Dogwood = Hawthorn	Balsam Poplar	
56	5	10	1	1	10	5	Dogwood = Hawthorn	White Ash = White Oak	
57	5	10		1	60	30	Dogwood	White Elm	
58	5	15	1	1	50	30	Dogwood	White Oak	
59	5	15		1	20	50	Hawthorn > Dogwood	White Elm	
60	5	15		1	10	60	Hawthorn =	White Elm > Red Oak	

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
							Dogwood		
61	5	25		1	5	60	White Ash	White Ash	
62	5	15	1	1	60	10	Dogwood >> Hawthorn	White Elm	
63	5	15	1	1	20	50	Hawthorn	White Ash > White Oak	
64		20		1		40		White Ash	Connectivity
65		20		5		60		Ash	Connectivity
66	5	20	1	1	40	40	Dogwood > Hawthorn	White Ash	
67	5	15	1	1	80	30	Dogwood	White Ash	
68	5	20	1	1	10	5	Hawthorn	White Ash	
69	5	15	1	1	30	50	Dogwood	White Ash	
70	5	20	1	1	40	60	Dogwood	White Ash > White Elm	
71		25		1		30		Willow	
72	5	20		2	80	80	Dogwood > Hawthorn	White Ash > Balsam Poplar	
73	5	20		3	80	80	Dogwood > Hawthorn	White Ash > Balsam Poplar	
74	5	15		1	30	40	Dogwood	White Ash	
75	5	20		1	80	80	Dogwood > Hawthorn	White Ash	
76	5	15		1	70	40	Dogwood	White Oak > White Ash	Special Habitat

Table 4.2 Hedgerow Assessment+

Hedgerow	Understory Height (m)	Canopy Height (m)	Understory Width (# tree widths)	Canopy Width (# tree widths)	Understory Cover (%)	Canopy Cover (%)	Understory Composition	Canopy Composition	Special Utility
									Potential (mast)
77	5	15		1	30	20	Dogwood	White Elm	
78	5	25		1	40	50	White Ash > Dogwood	White Ash	Connectivity
79	5	25		1	60	60	Dogwood	White Ash	
80	5	20		1	20	80	Dogwood = White Ash	White Ash	
81	5	20		2	20	70	Dogwood	White Ash	
82	2	15		1	60	50	White Ash = Dogwood	White Ash	
83	2	20		1	50	60	Dogwood	White Ash > White Elm	

Table 4.3 Rare Species Records for the Study Area

Common Name	Scientific Name	S-Rank	COSSARO	COSEWIC	Record Date	Status	Source
Plants							
Arrow Arum	*Peltandra virginica*	S2	-	-	1986		MNR/NHIC / Wetland Evaluation
Branching Bur-reed	*Sparganium androcladum*	S1	-	-	1897		NHIC
Grass-leaved Water-plantain	*Alisma granimeum*	S3S4	-	-	1986		Wetland Evaluation
Butternut	*Juglans cinerea*	S3?	END	END	2006		Stantec Observation
Birds							
King Rail	*Rallus elegans*	S2B, SZN	END-R	END	1956	Breeding	MNR/NHIC / OBBA
Black Tern	*Childonias niger*	S3B, SZN	SC	NAR	2005	Breeding	MNR/NHIC / OBBA / Stantec Observation
Black-crowned Night-heron	*Nycticorax nycticorax*	S3B, SZN	-	-	1991	Foraging	MNR/NHIC
Henslow's Sparrow	*Ammodramus henslowii*	S1B, SZN	END-R	END	1973	Breeding	MNR/NHIC
Least Bittern	*Ixobrychus exilis*	S3B, SZN	THR	THR	2005	Breeding	MNR/NHIC / OBBA

Table 4.3 Rare Species Records for the Study Area

Common Name	Scientific Name	S-Rank	COSSARO	COSEWIC	Record Date	Status	Source
Short-billed Dowitcher	*Limnodromus griseus*	S2S3B,SZN	-	-	unknown	Migrant	Wetland Evaluation
Caspian Tern	*Sterna caspia*	S3B,SZN	NAR	NAR	1986	Foraging	Wetland Evaluation / OBBA / Stantec Observation
Hudsonian Godwit	*Limosa haemastica*	S2S3B,SZN	-	-	unknown	Migrant	Wetland Evaluation
Stilt Sandpiper	*Calidris himantopus*	S2S3B,SZN	-	-	unknown	Migrant	Wetland Evaluation
Canvasback	*Aythya valisineria*	S1B,SZN	-	-	1986	Migrant	Wetland Evaluation / Stantec Observation
Redhead	*Aythya americana*	S2B,SZN	-	-	1986	Migrant	Wetland Evaluation / Stantec Observation
Wilson's Phalarope	*Phalaropus tricolor*	S3	-	-	2005	Winter visitor	CBC
Great Black-backed Gull	*Larus marinus*	S2	-	-	2005	Winter visitor	CBC
Short-eared Owl	*Asio flammeus*	S3S4	SC	SC	2005	Winter visitor, occasionally	CBC / Stantec Observation

Table 4.3 Rare Species Records for the Study Area

Common Name	Scientific Name	S-Rank	COSSARO	COSEWIC	Record Date	Status	Source
						breeding	
Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3	SC	SC	2005	Breeding	OBBA
Northern Bobwhite	*Colinus virginianus*	S1S2	END	END	2006	Released?	CBC
Bald Eagle	*Haliaeetus leucocephalus*	S4B, SZN	END-R	NAR	2006	Winter visitor	CBC / Stantec Observation
Golden Eagle	*Aquila chrysaetos*	S1B, SZN	END-R	NAR	2006	Winter visitor	CBC
Mammals							
Grey Fox	*Urocyon cinereoargenteus*	SZB?	THR	THR	1979	Non-breeding Vagrant	NHIC
Herpetofauna							
Common Musk Turtle	*Sternotherus odoratus*	S3	THR	THR	-		OHSA
Map Turtle	*Graptemys geographica*	S3	SC	SC	-		OHSA / Wetland Evaluation
Eastern Milksnake	*Lampropeltis triangulum*	S3	SC	SC	-		OHSA
Black Rat Snake	*Elaphe obsolete obsoleta*	S3	THR	THR	-		OHSA / Stantec Observation
Northern Ribbonsnake	*Thamnophis sauritus*	S3	SC	SC	-		OHSA

Table 4.3 Rare Species Records for the Study Area

Common Name	Scientific Name	S-Rank	COSSARO	COSEWIC	Record Date	Status	Source
Blanding's Turtle	*Emydoidae blandingi*	S3	THR	THR	-		OHSA / Stantec Observation
Fish							
Pugnose shiner	*Notropis anogenus*	S2	END	END	1982-1986		La Pan et al 2002
Bridle shiner	*Notropis bifrenatus*	S2	SC	SC	1982-1996		La Pan et al 2002
Channel darter	*Percina copelandi*	S2	THR	THR	1931 or earlier		La Pan et al 2002
Cutlip minnow	*Exoglossum maxillingua*	S1S2	THR	NAR	1982-1996		La Pan et al 2002
Lake sturgeon	*Acipenser fulvescens*	S3	NAR	SC	1982-1996		La Pan et al 2002
Grass pickerel	*Esox americanus vermiculatus*	-	-	SC	1982-1996		La Pan et al 2002

Table 4.3 Rare Species Records for the Study Area

Common Name	Scientific Name	S-Rank	COSSARO	COSEWIC	Record Date	Status	Source

S-Rank – Provincial rankings used by NHIC to set protection priorities for rare species. These ranks are not legal designations

COSSARO – The Committee on the Status of Species-at-Risk in Ontario. COSSARO is the MNR committee that evaluates the conservation status of species occurring in Ontario.

COSEWIC – The Committee on the Status of Endangered Wildlife in Canada. COSEWIC is the federal committee that evaluates the national status of species suspected to be at risk of extinction or extirpation.

S1(B) – Extremely rare in Ontario (during the breeding season)

S2(B) – Very rare in Ontario (during the breeding season)

S3(B) – Rare to uncommon in Ontario (during the breeding season)
SZB – Breeding migrants / vagrants

SZN – Non-breeding migrants / vagrants

END-(R) – Endangered (provincially regulated)

THR – Threatened

SC – Special concern

NAR – Not At Risk

CBC – Christmas Bird Count

NHIC – Natural Heritage Information Centre

OBBA – Ontario Breeding Bird Atlas

OHSA – Ontario Herpetofaunal Summary Atlas

Table 4.4 Butternut Health Assessment

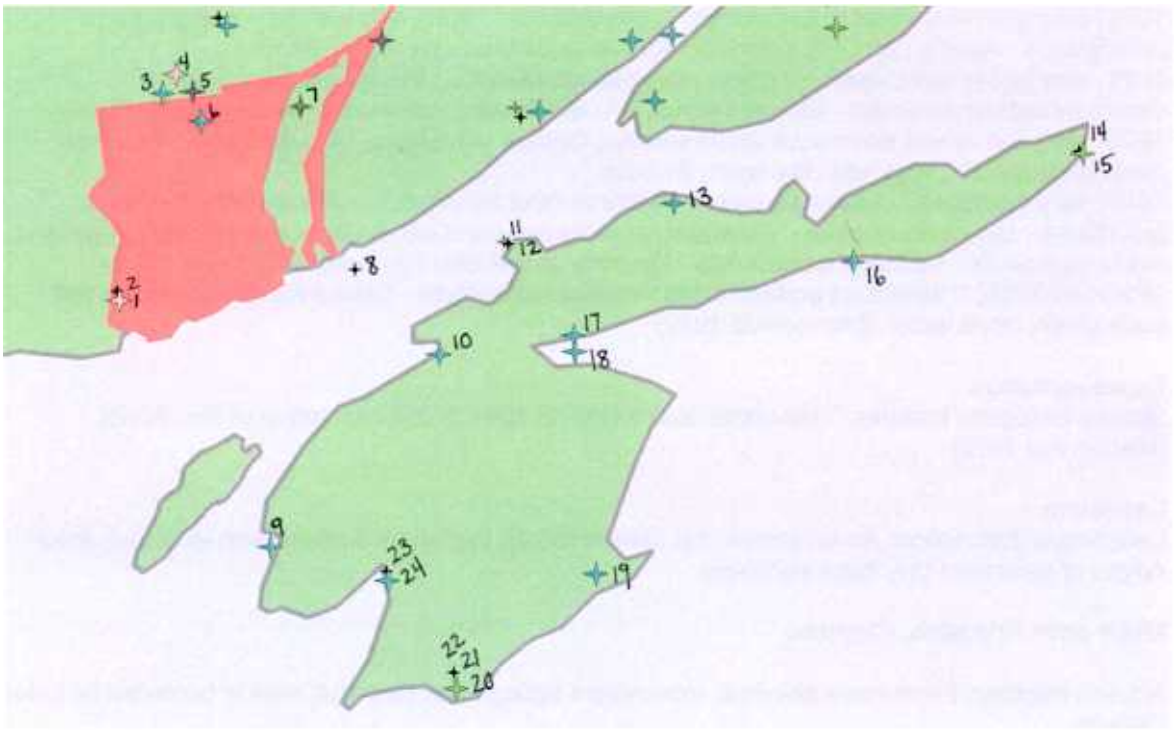
Tree #	Vigour	DBH (cm)	% Live Crown	Canker Symptoms Stem / Branch (Y/N)			% of Stem Circ. Cankered	Callused (y/n)	Archive (y/n)	Habitat
				trunk	branch	root crown				
1	1	~35	95	n	n	n	0	n	n	cultural woodland
2	1	~8	100	y	y	y	10	y	n	ash forest
3	1	~6	100	y	y	y	15	y	n	ash forest
4	1	~8	100	n	n	n	0	n	n	ash forest
5	1	~15	100	n	n	n	0	n	n	ash forest

Appendix C

NHIC Database Records

NHIC Search
160960180 – Wolfe Island Wind Project
January 4, 2007

Natural Areas



1. Little Cataraqui Marsh C.A.
2. Little Cataraqui Marsh
3. Little Cataraqui Creek Complex (PSW)
4. Little Cataraqui Creek C.A.
5. Cataraqui Creek Clay Ridges
6. Greater Cataraqui Marsh
7. Cataraqui River Marsh(es)
8. Thousand Islands National Park, Cedar Island
9. Sand Bay Wetland (PSW)
10. Barrett Bay Wetland (PSW)
11. Abraham's Head
12. Wolfe Island: Abraham's Head
13. Oak Point Wetland
14. Wolfe Island: Beauvais Point
15. Beauvais Point
16. Lewis Bay Wetland
17. Wolfe Island Wetland Complex (PSW)
18. Bayfield Bay Marsh (PSW)
19. Button Bay Wetland (PSW)
20. Wolfe Island: Big Sandy Bay (PSW)
21. Big Sandy Bay (ANSI)
22. Big Sandy Bay Wetland (PSW)
23. Reeds Bay (Earth Science Site)
24. Reeds Bay Wetland (PSW)

LITTLE CATARAQUI MARSH **AREA_ID: 7620**

Significance	Area Type	Size	Centroid UTM	Map #
	International Biological Program site	70.8 ha	18,376800,4898300	31C/2

Description
6E9 (6-15); extensive river mouth wetland along north cost of Lake Ontario on limestone plains;

well developed aquatic marshland and thicket complex with associate mixed and deciduous forests (5 communities); temperate and southern biota, with regionally significant flora and waterfowl nesting area; light to moderate drainage disturbances with potential development threat; Cataraqui Region CA, OMNR-E. [Falls et al. 1990]

Vegetation
Vegetation Summary:
1L21: saturated closed tall grass marsh; Typha latifolia - Typha angustifolia - Sparganium eurycarpum - Alisma spp.; P1; saturated fibrous muck over clay loam; 26.3 ha.
1L21: very wet to wet closed tall grass marsh fringe meadow; Phalaris arundinacea - Calamagrostis canadensis - Bidens cernua; P1; wet to very wet muck over clay loam; 10.1 ha.
1B22: very wet closed deciduous scrub swamp; Cornus stolonifera - Alnus rugosa - Fraxinus pennsylvanica; P1; very wet clay loam; 24.3 ha.
1A21: very wet closed deciduous loamland forest; Acer saccharum - Pinus strobus - Fagus grandifolia - Ulmus americana - Viburnum rafinesquianum - Ostrya virginiana - Prunus virginiana - Aralia nudicaulis - Solidago canadensis - Uvularia sessilifolia; F2; mesic clay loam; 8.1 ha.
1P21/1P23/1Q21: saturated aquatic moss; Nuphar variegatum - Lemna minor - algae; no soil code given; open water. [Macdonald 1972]

Representation
Special biological features: This marsh and forest complex is representative of the district. [Macdonald 1972]

Landform
Landscape description: An extensive, flat stream-mouth lakeshore wetland with local low, linear ridges of deformed clay loam substrate.

Major soils: Brunisols, Gleysols.

Aquatic habitats: Permanent swamps; intermittent springs and streams; area is bordered by Lake Ontario.

Special physical features: Poor development of distortion of glacial clay loam lake bed caused by calving and ice rafting and settling. [Macdonald 1972]

References

- Falls, J.B., I.D. Macdonald and T.J. Beechey. 1990. Catalogue of IBP/CT Areas in Ontario with an Assessment of their Current Conservation Status. Unpublished report. 94 pp.

- Macdonald, I.D. 1972. International Biological Programme, Checksheet for Region 5, Area 307: Little Cataraqui Marsh.

LITTLE CATARAQUI MARSH CONSERVATION AREA

AREA_ID: 2181

Significance	Area Type	Size	Centroid UTM	Map #
	Conservation Authority Area	0.0 ha	18,376800,4898000	31C/2

Description
Conservation Area

Vegetation

Representation
Landform
References

LITTLE CATARAQUI CREEK COMPLEX

AREA_ID: 7592

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	359.9 ha	18,379000,4904000	31C/7

Description
A Provincially significant, Coastal wetland complex, made up of three individual wetlands, composed of two wetland types (28% swamp and 72% marsh) (Boxall, 1992).

Vegetation
Dominant Vegetation Forms (Boxall, 1992):
5% deciduous trees, 1% coniferous trees, 23% tall shrub, 9% narrow-leaved emergents, 40% robust emergents, 17% submergents, 5% unvegetated;

Vegetation Communities (Boxall, 1992):
One Form
M1: robust emergents- Typha latifolia;
M6: narrow-leaved emergents- Phalaris arundinacea;
W8: submergents- Potamogeton spp., Myriophyllum spp., Elodea canadensis;

Two Forms
M2: narrow-leaved emergents- Leersia oryzoides, Carex spp., grasses; ground cover- Eupatorium maculatum, Bidens cernua, Alisma triviale;
M3: robust emergents- Typha latifolia; narrow-leaved emergents- Leersia oryzoides, Sparganium spp., Carex spp., grasses;
W4: submergents- Potamogeton spp., Myriophyllum spp.; free-floating plants- Lemna minor;
M9: narrow-leaved emergents- Phalaris arundinacea, Carex spp.; floating plants- Nymphaea odorata;
M10: narrow-leaved emergents- Butomus umbellatus, Phalaris arundinacea, Sparganium spp.; submergents- Elodea canadensis;
S1: tall shrubs- Salix spp.; narrow-leaved emergents- Carex spp., grasses;
S4: tall shrubs- Fraxinus nigra, Salix spp.; robust emergents- Typha latifolia;

Three Forms
M5: robust emergents- Typha latifolia; narrow-leaved emergents- Scirpus spp., Carex spp., grasses; free-floating plants- Lemna minor;
W7: submergents- Potamogeton spp., Myriophyllum spp.; floating plants- Nymphaea odorata; free-floating plants- Lemna minor;
M11: narrow-leaved emergents- Carex spp., grasses; submergents- Elodea canadensis, Potamogeton spp.; robust emergents- Typha latifolia
W13: submergents- Potamogeton spp., Myriophyllum spp.; free-floating plants- Lemna minor; dead shrubs- Salix spp., Cornus spp.;
S2: tall shrubs- Fraxinus nigra, Cornus spp.; low shrubs- Cornus spp., Spiraea alba; narrow-leaved emergents- Carex spp., grasses;
S3: deciduous trees- Fraxinus nigra; tall shrubs- Salix spp.; narrow-leaved emergents- Carex spp., grasses;
S5: tall shrubs- Fraxinus nigra, Salix spp., Cornus spp.; robust emergents- Typha latifolia; narrow-leaved emergents- Phalaris arundinacea;
S7: tall shrubs- Fraxinus nigra, Salix spp., Cornus spp.; low shrubs- Cornus spp., Salix spp.; ground cover- mixed forbes;
S8: tall shrubs- Alnus rugosa, Cornus spp.; narrow-leaved emergents- Carex spp., grasses; ground cover- mixed forbes;

S9: tall shrubs- Ulmus americana, Fraxinus nigra; narrow-leaved emergents- Sparganium spp.; dead coniferous trees- Thuja occidentalis
S10: tall shrubs- Alnus rugosa; robust emergents- Typha latifolia; dead deciduous trees- Fraxinus nigra;

Four Forms
M12: robust emergents- Typha latifolia; narrow-leaved emergents- Scirpus spp., Carex spp., Sparganium spp.; submergents- Potamogeton spp., Myriophyllum spp.; free-floating plants- Lemna minor;
S6: tall shrubs- Salix spp., Fraxinus nigra; low shrubs- Salix spp., Cornus spp., Spiraea alba; ground cover- mixed forbes; narrow-leaved emergents- Carex spp., grasses;
S11: coniferous trees- Thuja occidentalis; deciduous trees- Fraxinus nigra; tall shrubs- Fraxinus nigra, Thuja occidentalis; ground cover- Impatiens capensis, mixed ferns;
S12: tall shrubs- Salix spp., Cornus spp.; low shrubs- Salix spp., Cornus spp.; narrow-leaved emergents- Carex spp., grasses; robust emergents- Typha latifolia;
S14: deciduous trees- Acer rubrum; tall shrubs- Acer rubrum, Alnus rugosa; ground cover- mixed ferns; narrow-leaved emergents- Carex spp., grasses;

Five Forms
S13: tall shrubs- Alnus rugosa, Salix spp.; low shrubs- Alnus rugosa, Salix spp.; narrow-leaved emergents- Carex spp., grasses; robust emergents- Typha latifolia; ground cover- mixed forbes;

Representation

Landform
Soils (Boxall, 1992): 20% clay/ loam, 60% humic/ mesic, and 20% fibric;
Site Type (Boxall, 1992): 29% palustrine, 44% riverine, 17% riverine at rivermouth, and 10% lacustrine exposed to lake;

References

- Boxall, J. 1992. Southern Ontario Wetland Data Record and Evaluation (August 1992 Draft)- Little Cataraqui Marsh Complex. July 20-22 & August 10, 1992. Consultant. Manuscript. 43 pp + 3 pp.

- Cutler, C., G. Humphreys, A. Bougourd and E. Mallory. 1984. Wetland Data Record and Evaluation- Little Cataraqui Creek. Second Edition. September 5, 1984. Cataraqui Conservation Authority. Manuscript. 22 pp + 1 map + 7 pp supplement.

- Mosquin, T. and J.R. Wilson. 1985. Wetland Data Record and Evaluation- Little Cataraqui Marsh. Second Edition. July 24-25 & August 26, 1985. Mosquin Bio-Information. Manuscript. 12 pp + 1 p supplement.

- Mosquin, T. and J.R. Wilson. 1985. Wetland Data Record and Evaluation- Little Cataraqui Resevoir Complex. Second Edition. July, 1985. Mosquin Bio-Information. Manuscript. 12 pp + 1 p supplement.

LITTLE CATARAQUI CREEK CONSERVATION AREA

AREA_ID: 7613

Significance	Area Type	Size	Centroid UTM	Map #
	Conservation Authority Area	391.0 ha	18,379500,4904500	31C/7

Description

Vegetation
Representation
Landform
References

CATARAQUI CREEK CLAY RIDGES

AREA_ID: 7937

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Earth Science ANSI	0.0 ha	18,379900,4903900	31C/7

Description
Vegetation
Representation
Landform
References

GREATER CATARAQUI MARSH

AREA_ID: 6230

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	504.0 ha	18,380000,4903000	31C/8

Description
A Provincially significant, Coastal wetland, composed of only one wetland type (100% marsh) (Mudal and Krannitz, 1990).

Vegetation
Vegetation Communities (Mudal and Krannitz, 1990):
One Form
M1: robust emergents- cattail;
M2: narrow-leaved emergents- grasses;
W1: submergents- milfoil;

Two Forms
M3: robust emergents- cattail, bulrush; narrow-leaved emergents- grasses, sedges;
M4: robust emergents- cattail; free-floating plants- Frogbit;
M5: narrow-leaved emergents- grasses; ground cover- mint, jewelweed;
M6: robust emergents- cattail; ground cover- Purple Loosestrife;
M7: narrow-leaved emergents- sedges, grasses; robust emergents- cattail;
M8: narrow-leaved emergents- Reed Canary Grass; tall shrubs- dogwood;
W2: submergents- milfoil; floating plants- waterlilies;
W3: floating plants- waterlilies; submergents- milfoil;
W4: submergents- milfoil; free-floating plants- duckweed;

Three Forms
M9: robust emergents- cattail; free-floating plants- Frogbit; narrow-leaved emergents- grasses;
M10: robust emergents- cattail; narrow-leaved emergents- grasses, sedges; ground cover- joe-pye weed;
M11: robust emergents- cattail; narrow-leaved emergents- grasses, sedges; broad-leaved emergents- arrowhead;
M12: narrow-leaved emergents- grasses; robust emergents- cattail; ground cover- boneset;
M13: narrow-leaved emergents- Sparganium spp.; submergents- milfoil; robust emergents- Typha spp.;

Four Forms
M14: robust emergents- cattail; narrow-leaved emergents- grasses; ground cover- Marsh Fern;

mosses;

Representation
Landform
Soils (Mudal and Krannitz, 1990): 20% clays, loams or silts and 80% organic;
Site Type (Mudal and Krannitz, 1990): 100% riverine;

References

- Blancher, P. and L. Deacon. 1983. Wetland Data Record and Evaluation- Greater Cataraqui Marsh. First Edition. November 15, 1983. Biology Department, Queen's University, Kingston. Manuscript. 20 pp + 1 map.

- Muldal, S. and P. Krannitz. 1990. Wetland Data Record and Evaluation- Greater Cataraqui Marsh. Second Edition. July 31 & August 1 and 6, 1990. TNK Environmental Consultants. Manuscript. 11 pp + 1 map + 8 pp supplement.

SAND BAY- WETLAND **AREA_ID: 9892**

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	65.0 ha	18,380200,4890000	31C/1

Description
A Provincially significant wetland, composed of two wetland types (10% swamp and 90% marsh) (Mosquin and Wilson, 1986).

Vegetation
Vegetation Communities (Mosquin and Wilson, 1986):
One form
M: submergents- Myriophyllum sp.;
M: robust emergents- Typha sp.;

Two forms
M: narrow-leaved emergents- Reed Canary Grass; Verbena sp.;
M: free-floating plants- Nymphaea sp.; Myriophyllum sp.;
M: robust emergents- Typha sp.; Sparganium sp.;

Three forms
S: tall shrubs- Cornus sp./ Salix sp.; Carex sp.; jewelweed;
S: deciduous trees- Black Ash; Cornus stolonifera; jewelweed;

Representation

Landform
Soils (Mosquin and Wilson, 1986): 75% clays, loams or silts, and 25% organic;
Site Type (Mosquin and Wilson, 1986): 15% riverine, 15% lacustrine (at rivermouth), and 70% lacustrine (exposed to lake);

References

- Mosquin, T. and J.R. Wilson. 1986. Wetland Data Record and Evaluation- Sand Bay. Second Edition. Aug 1986. Mosquin Bio-Information. Manuscript. 22 pp.

CATARAQUI RIVER MARSH

AREA_ID: 7877

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Life Science ANSI	400.0 ha	18,383000,4903000	31C/8

Description

This is a large wetland and upland complex near the mouth of the Cataraqui River which encompasses excellent examples of the representative and significant river valley and coastal wetland landforms of the Napanee Plain Physiographic Region. It is located on the eastern fringe of Kingston, bounded on the west by the Canadian National railway tracks, on the north by the Macdonald - Cartier Freeway, and on the east by the rim of the valley. [Macdonald 1987]

Vegetation

The site's vegetation features reflect the temperate and southern affinities of the area's location. The wetlands include large marshlands which are dominated by stands of broad leaved cattail (Typha latifolia), and are accompanied by several other wet meadows and marsh types with Canada blue joint (Calamagrostis canadensis), sedges (Carex aquatilis, C. lacustris, C. stricta), reeds and bulrushes (Scirpus acutus, S. cyperinus, S. fluviatilis), spike rush (Eleocharis smallii), green burreed (Sparganium eurycarpum) and others as their dominants. Scattered throughout the wetland and along its margins are discontinuous swamp thickets and groves of speckled alder (Alnus incana subsp. rugosa), winterberry (Ilex verticillata), nannyberry (Viburnum lentago), red osier dogwood (Cornus stolonifera), red ash (Fraxinus pennsylvanica), silver maple (Acer saccharinum), crack willow (Salix fragilis) and others. Many openings in the marshes and thickets and along the course of the river, and its tributaries also create frequent aquatic communities. These also provide excellent habitat for waterfowl and other wildlife. The mesic slopes of the limestone valley support deciduous and mixed forests of submature to young age classes. On the drier sites, is the predominant deciduous forest cover of northern red oak - sugar maple - white ash - shagbark hickory (Quercus rubra - Acer saccharum - Fraxinus americana - Carya ovata). As well there are coniferous and mixed forests of eastern hemlock -eastern white pine (Tsuga canadensis - Pinus strobus) and, on the granitic situations on the northern edge of the sites, of eastern white cedar (Thuja occidentalis). The surrounding uplands of the limestone plain are disturbed by pasture, cultivation, successional forbs and thickets, and housing development; hence they support rather weedy community patterns. [Macdonald 1987]

Representation

Landform

The landform features of this site are dominated by the broad valley which encompasses an extensive wetland complex at the mouth of the Cataraqui River. The water level of the marsh is controlled by that of Lake Ontario, but is well protected from the lake's environment. The open water body of the river mouth occupies about half of the surface area, with the rest, particularly in the northwestern portion, presenting fibrous mucklands. The saturated to wet moisture regime conditions of the wetland have allowed these fibrous mucks to develop. The valley slopes present several limestone terrace levels with more deeply soiled substrates which are circummesic and sandy to loamy in texture. An gneissic outcrop of the Frontenac Axis lies just to the north of the area, marking the edge of the Leeds Knobs and Flats Physiographic Region. [Macdonald 1987]

References

- Catling, P.M. 1985. Description and Analysis of the Vascular Flora of the Cataraqui Marsh Area. Technical Bulletin 1985-7E, Research Branch, Agriculture Canada, Ottawa. 63 pp.

- Macdonald, I.D. 1987. Life Science Areas of Natural and Scientific Interest in Site District 6-15. Draft. Ontario Ministry of Natural Resources, Eastern Region, Kemptville. SR OFER 8603. viii + 149 pp.

CATARAQUI RIVER MARSHES

AREA_ID: 137

Significance	Area Type	Size	Centroid UTM	Map #
	Life Science Site	ha	18,383000,4903000	31C/8

Description
Cataraqui River Marshes are a large wetland and upland complex with excellent examples of representative and significant river valley and coastal wetland landforms. Marsh and aquatic habitats, which represent 80% of area, have a higher diversity of aquatic plants than most other marshes in the Great Lakes system. This wetland, encompassed by broad valley of Cataraqui River, is one of most important wildlife areas along Rideau Canal system. Half of surface area is open water, while remaining, especially in NW is fibrous mucklands. Vegetation reflects southern, western and Appalachian affinities. Upper portion has high granite ridge while further south limestone slopes rim broader river basin. Communities present include various deciduous, mixed and coniferous forest types on dry to moist soils and talus slopes, swamp thickets, and numerous aquatic community types, although cattail marsh predominates. [Woulfe and McKay-Kuja 1991]

Vegetation
Representation
Landform

References

- Catling, P.M. 1985. Description and Analysis of the Vascular Flora of the Cataraqui Marsh Area. Technical Bulletin 1985-7E, Research Branch, Agriculture Canada, Ottawa. 63 pp.

- Macdonald, I.D. 1987. Life Science Areas of Natural and Scientific Interest in Site District 6-15. Draft. Ontario Ministry of Natural Resources, Eastern Region, Kemptville. SR OFER 8603. viii + 149 pp.

- Woulfe, M. and S. McKay-Kuja. 1991. Biodiversity Conservation Database - Site Basic Record: Cataraqui River Marshes. Ontario Conservation Data Centre. [9 pp.].

REEDS BAY

AREA_ID: 10124

Significance	Area Type	Size	Centroid UTM	Map #
	Earth Science Site	34.4 ha	18,383500,4888800	31C/1

Description
Vegetation
Representation

Landform
This site, adjacent to Big Sandy Bay, Wolfe Island, does not exhibit unique vegetational features but is nonetheless of interest because of a series of what appear to be large, parallel glacial striae, visible just below the water's surface at Reeds Bay. The site was first noted during an aerial flight over the Big Sandy Bay area and as yet not thoroughly examined from the ground. [Luciuk 1976]

References

- Luciuk, L.Y. 1976. Life Science Inventory Checklist: Reeds Bay. Ontario Ministry of Natural Resources, Division of Parks, Park Planning Branch. 1 p.

REEDS BAY- WETLAND

AREA_ID: 9856

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	27.0 ha	18,383500,4888500	31C/1

Description
A Provincially significant wetland, composed of one wetland type (100% marsh) (White, 1986).

Vegetation
Vegetation Communities (White, 1986):
Marsh
M1: robust emergents- Typha sp.; Lemna sp.;
M2: submergents- Myriophyllum sp.;
M3: submergents- Myriophyllum sp.; Sagittaria sp.; Nuphar sp.; Lemna sp.;

Representation

Landform
Soils (White, 1986): 50% clays, loams or silts, and 50% organic;
Site Type (White, 1986): 30% lacustrine (at rivermouth), 30% lacustrine (on enclosed bay), and 40% lacustrine (exposed to lake);

References

- White, D. 1986. Wetland Data Record and Evaluation- Reeds Bay. Second Edition. July 24, 1986. Environmental Applications Group. Manuscript. 21 pp.

- White, D., and J. Sparling. 1987. Evaluation of 26 wetlands in Napanee and Tweed Districts Eastern Region. Part 1- Summary Report. The Environmental Applications Group Limited. 65 pp + iii pages (includes VC mapping for each wetland).

THOUSAND ISLANDS NATIONAL PARK - CEDAR ISLAND

AREA_ID: 4027

Significance	Area Type	Size	Centroid UTM	Map #
	International Biological Program site	3.2 ha	18,383900,4897900	31C/1

Description
7E5 (6-15); small St. Lawrence River Island, with moderately rolling gneissic and limestone outcrops; dry mesic rockland meadows, groves, and thickets, and shoreline meadows and marshes (6 communities); temperate and southern biota, with rich regionally significant flora; moderate disturbance from picnics and past fires; Parks Canada, A.E. Garwood. [Falls et al. 1990]

Vegetation
Vegetation Summary:

1H21e: shingle beach; Vaccinium - Arctostaphylos - Aronia; I1; exposed granitic outcrops; 0.6 ha.
1M22: shoreline marsh; Poa - Glyceria - Polygonum; P2; shoreline muck; 0.10 ha.
1B21a: scrubland; Sambucus - Prunus - Rubus; F3(4+); 0.13 ha.
1D21: open forest; Quercus - Prunus - Acer; F4(5); 1.8 ha.
1M21: meadow; Festuca - Luzula; F4; 0.36 ha.
2A14a: shingle beach; Juniperus - Physocarpus; I1; exposed limestone blocks (as shingle); 0.06 ha. [Macdonald 1971]

The vegetation associations found on the island are as follows:
1. Open shoreline in north half of island: a rocky outcropping of granitics having only a few hickories and white oaks growing in cracks and crevasses. Vaccinium sp. , Arctostaphylos uva-ursi and Aronia melanocarpa are common on the shore also.

2. Open swampy shoreline: there are two shallow bays on the island that allow a marshy habitat of Butomus umbellatus, Polygonurn punctatum, Poa palustris, and other grasses to grow.

3. There is a scrubland in more disturbed northern sections of the island that have Sambucus pubens, Rubus spp., Prunus pensylvanica and P. virginiana; these areas tend to be on the highest part of the island reaching to 9 metres above the lake level.

4. There is a rather open forest., of white and red oaks (Quercus alba, Q. borealis), sugar maple (Acer saccharum), black cherry (Prunus serotina) and scattered hickory (Carya ovata) and white pine (Pinus strobus). The trees reach 10 to 20 cm. in diameter.

5. At the main picnic pavilion are scattered trees of oak and hickory and a planted lawn of Festuca rubra var. copillata and endemic Luzula campestris.

6. On the limestone shoreline beach are scattered trees of white cedar (Thuja occidentalis), red cedar (Juniperus virginiana), juniper (J. communis) and ninebark (Physocarpus opulifolius) showing a distinct association change from that of the granitic shoreline. [Macdonald 1971]

Representation
Special biological features: Good example of oak-maple forest type. [Macdonald 1971]

Landform
Landscape description: Island just offshore, most of which is gently rolling limestone knolls, but whose northern section is granitic.

Major soils: Regosols, Gleysols, Brunisols, Luvisols.

Aquatic habitats: Intermittent swamps; bordered by Lake Ontario.

Special physical features: Contact zone between limestone and granite. [Macdonald 1971]

References

- Falls, J.B., I.D. Macdonald and T.J. Beechey. 1990. Catalogue of IBP/CT Areas in Ontario with an Assessment of their Current Conservation Status. Unpublished report. 94 pp.

- Leach, E. 1966. The Flora of Cedar Island and Cartwrights Point and Its Recent History. B.Sc. Thesis, Department of Biology, Queen's University, Kingston. ii + 84 pp.

- Macdonald, I.D. 1971. International Biological Programme, Checksheet for Region 5, Area 308: Thousand Islands National Park - Cedar Island.

WOLFE ISLAND - BIG SANDY BAY

AREA_ID: 7772

Significance	Area Type	Size	Centroid UTM	Map #
	International Biological Program site	413.2 ha	18,385000,4885500	31C/1

Description

6E9 (6-15); extensive Lake Ontario shore sand deposit with sand ridges, dunes, enclosed bog and pond, wetland peat deposit, and surrounding flat limestone and clay plain; well developed series of lowland and wetland forests thickets, meadows and marshes, with a small bog heath, forest and aquatics, upland forests and meadows, and shore barrens (33 communities); southern, Great Lakes and temperate biota, with provincially and regionally significant flora and fauna; OMNR-E, St. Lawrence PC, I.D. Macdonald, CWS. [Falls et al. 1990]

Vegetation

Vegetation Summary:
3D21: open water; no species composition information given; no soil code given; saturated, deep open water; together with community 2 covers an area of 13.0 ha.
2I22: submergent aquatic meadows; Najas flexilis - Vallisneria americana - Utricularia spp.; O; saturated, open water; together with community 1 covers an area of 13.0 ha.
2G22: emergent aquatic meadows; Pontederia cordata - Scirpus americanus - Nuphar variegatum; O; saturated, open water; present, community size not indicated.
2F21: shoreline fringe on muck; Decodon verticillatus - Sagittaria latifolia - Pontederia cordata; O; saturated, flocculent muck; 0.4 ha.
1M22: shoreline floating muck matte; Eleocharis acicularis; O; saturated, fibrous muck; community size not indicated, present.
1M22: mixed shortgrass marsh; Calamagrostis canadensis - Typha latifolia - Carex lacustris - Cicuta bulbifera; O; saturated, peaty muck; together with community 7 covers 16.2 ha.
L22: tall grass cattail marsh; Typha latifolia - Carex lacustris - Iris versicolor; O; saturated, peaty muck; together with community 6 covers 16.2 ha.
1C21: very wet pond fringe heath; Decodon verticillatus - Thelypteris palustris - Potentilla palustris - Calamagrostis canadensis; O; saturated, fibrous muck; community size not indicated, present.
1G22: pond fringe/bog heath transition; Chamaedaphne calycullata - Decodon verticillatus - Cephalanthus occidentalis - Sphagnum spp. - Carex spp. - Polygonum coccinea - Potentilla palustris - Calla palustrus; O; saturated fibrous peat; together with community 10 covers 10.5 ha.
1C13a: wet closed peatland evergreen heath; Chamaedaphne calycullata - Andromeda glaucophylla - Aronia melanocarpa - Sphagnum spp. - Vaccinium macrocarpon - Carex lasiocarpa - Carex chordorrhiza; O; wet peat; together with community 9 covers 10.5 ha.
1B22a: very wet closed deciduous swamp scrub; Cephalanthus occidentalis - Alnus rugosa - Salix spp. - Lemna minor - Riccia fluitans - Scirpus cyperinus - Juncus sp.; O; very wet muck; 8.5 ha.
1B22a: very wet to wet closed deciduous swamp scrub; Alnus rugosa - Acer rubrum - Cornus stolonifera - Calamagrostis canadensis - Bidens spp. - Thelypteris palustris; O; very wet fibrous muck; 57 ha.
1B22a: wet to very wet closed deciduous swamp scrub; Ilex verticillata - Acer rubrum - mosses - Osmunda regalis - Dryopteris cristata - Calla palustris - Thelypteris palustris; O; very wet fibrous muck; 49 ha.
1A22: wet closed deciduous peatland forest; Larix laricina - Chamaedaphne calycullata - Acer rubrum - Vaccinium corymbosum - Sphagnum spp. - Carex disperma - Osmunda cinnamomea; O; wet peat; 5.3 ha.
1A22: wet closed deciduous peatland swamp forest; Larix laricina - Acer rubrum - Ilex verticillata - Vaccinium corymbosum - Chamaedaphne calycullata - Ledum groenlandicum - Sphagnum spp. - Sarracenia purpurea - Carex disperma - Osmunda cinnamomea; O; wet peat; 67 ha.
1A22: wet closed deciduous swamp forest; Acer rubrum - Alnus rugosa - Ilex verticillata -

Vaccinium corymbosum - Sphagnum spp. - Osmunda regalis - Carex spp. - Thelypteris palustris; P1; wet mucky sand; 45 ha.
1A22: wet closed deciduous swamp forest; Acer saccharinum - Alnus rugosa - Ilex verticillata - Cephalanthus occidentalis - Impatiens biflora - Onoclea sensibilis - Osmunda regalis - Peltandra virginica; P1; wet mucky sand; 49 ha.
1M22: emergent sand shoreline meadow; Scirpus americanus - Cyperus diandrus - Juncus alpinus; P1; saturated sand; community size not indicated, present.
2G22: open dune slack meadow; Juncus alpinus - Equisetum arvense; P1; very wet sand; communities 19-25 form a mosaic of 8.1 ha.
3C2-: open sand beach; Cakile edentula; I2; sand; communities 19-25 form a mosaic of 8.1 ha.
2G22: open face of primary dunes; Elymus canadense - Artemisia campestris - Salix lucida; I2; dry sand; communities 19-25 form a mosaic of 8.1 ha.
1G22: dry semiopen scrubby dune crest; Salix cordata - Salix interior - Smilacina stellata - Euphorbia polygonifolia - Equisetum hyemale - Lathyrus maritimus; I2; dry sand; communities 19-25 form a mosaic of 8.1 ha.
1M21: closed sand dune and beach meadow; Ammophila breviligulata - Artemisia campestris; I2; dry sand; communities 19-25 form a mosaic of 8.1 ha.
1C21a: semiclosed sand dune vine heath; Vitis riparia - Rhus radicans - Salix interior - Sporobolus cryptandrus; I2; dry sand; communities 19-25 form a mosaic of 8.1 ha.
1B21: dry closed deciduous sandland scrub; Salix interior - Salix cordata - Populus deltoides - Vitis riparia - Poa compressa - Elymus canadensis - Arenaria stricta; I2; dry sand; communities 19-25 form a mosaic of 8.1 ha.
1A21: dry closed deciduous dune gr[o]ve; Populus deltoides - Betula papyrifera - Tilia americana - Equisetum arvense - Solidago canadense - Aralia nudicaulis - Hydrophyllum virginianum; F1; dry sand, very immature profile; 0.8 ha.
3C2-: very dry limestone cliff face; Draba alpina - Epilobium spp. - mosses - lichens; I2; arid limestone; community size not indicated, present.
1N21: pasturelands; Phleum pratense - Trifolium pratense - Vicia cracca - Potentilla recta; F1; dry limestone soil, thin; 53 ha.
1E21: dry mesic semiopen deciduous savanna; Quercus borealis - Carya ovata - Prunus americana - Carex pensylvanica - Poa compressa; F2; dry mesic loam on limestone; 0.4 ha.
1A21: mesic closed deciduous forest; Acer saccharum - Fagus grandifolia - Quercus borealis - Tilia americana - saplings of the above - Ostrya virginiana - Carex pensylvanica - Hydrophyllum virginianum - Viola pubescens; F2; dry mesic to mesic loam; 10.1 ha.
1M21: pastures and croplands; no species composition information given; F2; well drained loam; together with community 32 covers an area of 15.4 ha.
1N21: old fields; Phleum pratense - Poa compressa - Solidago canadensis; F2; sandy loam; together with community 31 covers an area of 15.4 ha.
1E21: old field succession; Populus tremuloides - Acer saccharum - Pyrus malus - Spiraea alba - Viburnum dentata - Cornus stolonifera - Phleum pratense - Solidago spp. - Poa compressa; F2; sandy loam; 10.9 ha. [Macdonald 1972]

Representation
Special biological features: Excellent development of sand dune bar and peatland heath and forest complexes being somewhat singular in significance for the district. [Macdonald 1972]

Landform
Landscape description: Extensive sandy bay complex formed on flat, level limestone cuesta shoreline: area includes sand dunes forming a bay mouth barrier, a pond and a peatland development.

Major soils: Organic soils, Gleysols. Regosols, Chernozems. Brunisols.

Aquatic habitats: Permanent ponds and streams; intermittent springs; salt slacks; area borders on Lake Ontario.

Special physical features: Sand dunes, peatland; black water pond forming in pond of sandy bay. [Macdonald 1972]

References

- Falls, J.B., I.D. Macdonald and T.J. Beechey. 1990. Catalogue of IBP/CT Areas in Ontario with an Assessment of their Current Conservation Status. Unpublished report. 94 pp.

- Macdonald, I.D. 1972. International Biological Programme, Checksheet for Region 5, Area 311: Wolfe Island - Big Sandy Bay.

BIG SANDY BAY

AREA_ID: 7919

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Earth Science ANSI	500.0 ha	18,385000,4885000	31C/1

Description
Vegetation
Representation
Landform
References

BIG SANDY BAY- WETLAND

AREA_ID: 9868

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	338.0 ha	18,385000,4885000	31C/1

Description
A Provincially significant wetland, composed of three wetland types (7% bog, 82% swamp and 11% marsh) (Mosquin and Wilson, 1986).

Vegetation
Vegetation Communities (Mosquin and Wilson, 1986):
One form
M: submergents- Myriophyllum sp.;

Two forms
M: robust emergents- Typha sp.; Calla palustris;
S: deciduous trees- soft maple; ferns;
M: narrow-leaved emergents- Reed Canary Grass; joe-pye weed;

Three forms
M: robust emergents- Typha sp.; Nuphar sp.; Myriophyllum sp.;
S: tall shrubs- Alnus rugosa; Calla sp.; jewelweed;
S: tall shrubs- Alnus rugosa; Calla sp.; Lemna minor;
S: deciduous trees- Silver Maple; Carex sp.; jewelweed;
S: deciduous trees- Silver Maple; Cornus sp.; jewelweed;
B: low shrubs- Ledum sp./ Myrica sp.; blueberry; Sphagnum sp.;

Four forms
S: dead trees; Calla sp.; Carex sp.; Lemna minor;
S: tall shrubs- Cornus sp.; Calla sp.; Carex sp.; Lemna minor;
S: deciduous trees- maple; Alnus rugosa; ferns; brown moss;

S: tall shrubs- Salix sp./ Alnus sp.; Typha sp.; jewelweed; Lemna minor;
S: tall shrubs- Salix sp./ Alnus sp.; Myrica gale; Carex sp.; Galium sp.;
M: low shrubs- Myrica gale; Typha sp.; Juncus sp.; Galium sp.;

Five forms
S: deciduous trees- Red Maple; Alnus sp.; Calla sp.; ferns; brown moss;
B: coniferous trees- Black Spruce; Dwarf Birch; Myrica gale, Ledum sp.; blueberry; Sphagnum sp.;

Representation

Landform
Soils (Mosquin and Wilson, 1986): 100% organic;
Site Type (Mosquin and Wilson, 1986): 100% lacustrine (on enclosed bay);

References

- Mosquin, T. and J.R. Wilson. 1986. Wetland Data Record and Evaluation- Big Sandy Bay. Second Edition. May, Aug1986. Mosquin Bio- Information. Manuscript. 22 pp + 5 pp supplement.

WOLFE ISLAND BIG SANDY BAY

AREA_ID: 1061

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Life Science ANSI	500.0 ha	18,385000,4885000	31C/1

Description
This is a large wetland complex which occurs in association with an exposed coastal sand bar on the clay plain landforms of the Napanee Plain Physiographic Region. [Macdonald 1987]

Vegetation
The vegetation features of the site reflect conditions which are typical of the coastal shore and wetland environments within the site district; as well, it presents several distinctive situations. The northwestern section of the wetland basin is dominated by a large swamp thicket complex of speckled alder (Alnus incana ssp. rugosa), with a mixture of thickets of buttonbush (Cephalanthus occidentalis), willow (Salix species), red osier dogwood (Cornus stolonifera), and winterberry (Ilex verticillata). The lake side fringe of this wet basin supports a series of marsh communities of Canada blue joint (Calamagrostis canadensis), broad leaved cattail (Typha latifolia), giant burreed (Sparganium eurycarpum), sedges (Carex lasiocarpa, C. retrorsa, C. vesicaria), bulrushes (Scirpus cyperinus, S. atrovirens) and others. A deciduous swamp forest of red ash - silver maple (Fraxinus pennsylvanica - Acer saccharinum), and local successional lowland groves of trembling aspen (Populus tremuloides) form a fringe around its inland portions. The southeastern section of the basin supports a notable, large mixed swamp forest of red maple - tamarack (Acer rubrum - Larix laricina) in its interior portions, with discontinuous groves, thickets and marshes of the above communities around its periphery. As well, there is a small, but well developed, bog heath of leatherleaf - water willow - sphagnum (Chamaedaphne calyculata - Decodon verticillata - Sphagnum species) around the small pond. The coastal sand ridges and dune features support a limited variety of typical communities, including beach barrens, meadows of beach grass - Canada wild rye (Ammophila breviligulata - Elymus canadensis), thickets of stiff and sandbar willows (Salix eriocarpa - S. exigua) and groves of eastern cottonwood - crack willow (Populus deltoides - Salix fragilis). There is a small upland deciduous grove of sugar maple - American beech - red oak (Acer saccharum - Fagus grandifolia - Quercus rubra) at the base of the southeastern peninsula. The surrounding interior plains, including the two limestone peninsulas, have cultivar and pasture species with local cliff species such as araby whitlow grass

(Draba arabisans) on their low shorecliffs. [Macdonald 1987]

Representation

Landform
The landform features of this site are controlled by the gentle, southwestward sloping limestone plain. This presents three low scarps and ridges, the outer two of which project into Lake Ontario as peninsulas. A barrier sand bar has developed within the resulting bay, and protected wetland conditions are created behind it. A well developed muck and peat deposit forms a mantle over the lacustrine clay and silt deposit in the protected site. Additionally, the sand bar has a low dune and ridge formation along its entire length, and a small pond has developed behind the dunes of the southeastern third. There is a spectrum of dry to saturated moisture regime conditions on these sand, clay and organic substrates. [Macdonald 1987]

References

- Lindsay, K.M. 1978. Wolf Island Park Reserve: Draft Life Science Inventory Check-sheet. Ontario Ministry of Natural Resources, Central Region, Richmond Hill.

- Luciuk, L.Y. 1976. Life Science Inventory Checklist: Big Sandy Bay (Wolfe Island). Ontario Ministry of Natural Resources, Division of Parks, Park Planning Branch.

- Macdonald, I.D. 1987. Life Science Areas of Natural and Scientific Interest in Site District 6-15. Draft. Ontario Ministry of Natural Resources, Eastern Region, Kemptville. SR OFER 8603. viii + 149 pp.

BARRETT BAY- WETLAND

AREA_ID: 9890

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	34.0 ha	18,386000,4895000	31C/1

Description
A Provincially significant wetland, composed of one wetland type (100% marsh) (White, 1986).

Vegetation
Vegetation Communities (White, 1986):
Marsh
M1: robust emergents- Typha sp.; Lemna sp.; Hydrocharis sp.;
M2: submergents- Myriophyllum sp.; Nuphar sp.;

Representation

Landform
Soils (White, 1986): 20% clays, loams or silts, and 80% organic;
Site Type (White, 1986): 100% riverine;

References

- White, D. 1986. Wetland Data Record and Evaluation- Barrett Bay. Second Edition. July 22, 1986. Environemntal Applications Group. Manuscript. 22 pp + 1 pp supplement.

- White, D., and J. Sparling. 1987. Evaluation of 26 wetlands in Napanee and Tweed Districts Eastern Region. Part 1- Summary Report. The Environmental Applications Group Limited. 65 pp + iii pages (includes VC mapping for each wetland).

ABRAHAM HEAD

AREA_ID: 17820

Significance	Area Type	Size	Centroid UTM	Map #
	Life Science Site	70.82 ha	18,388400,4898100	31C/1

Description
Vegetation
Representation

Landform
A relatively flat limestone point with an irregular coastline and soil types ranging from a shallow loam through rendzina soils to a wet muck (Luciuk, 1975).

References

- Luciuk, L.Y. 1975. Life Science Inventory Checklist- Abraham Head (Wolfe Island). 2 pp + 1 map.

WOLFE ISLAND - ABRAHAM'S HEAD

AREA_ID: 4016

Significance	Area Type	Size	Centroid UTM	Map #
	International Biological Program site	80.0 ha	18,388500,4898000	31C/1

Description
7E5 (6-15); flat limestone and clay plain forming headland in St. Lawrence River; upland forests and meadows, and shoreline marshes (8 communities); temperate and southern biota; increasing cutting and cottage development disturbances; Cataraqui Region CA, I.D. Macdonald. [Falls et al. 1990]

Vegetation
Vegetation Summary:
1A21: closed forest; Quercus alba - Carya ovata; F2; shallow loam over limestone; 19.0 ha.
1J21: open forest; Quercus alba - Carya ovata; F2; shallow loam over limestone; 7.7 ha.
1A22: fringe forest; Acer saccharinum; O; muck; 0.5 ha.
1J21: savanna; Crataegus sp.; F1; rendzina; 3.0 ha.
1M21: dry meadows and pastures; F1; rendzina; 34.9 ha.
1M22: sward; Carex spp. - Juncus spp.; F1; shallow loam till over limestone, but wet and more clay; 4.0 ha.
2G22: weedy limestone beach forbs; F1; bare rock (limestone); 1.0 ha.
1L21: marsh; Typha latifolia; O; muck; 11.2 ha. [Hainault 1969]

Representation
Special biological features: The stand is one of the few remaining examples of oak - hickory forest in the region. [Hainault 1969]

Landform
Landscape description: Flat limestone point with irregular coastline.

Major soils: Shallow loam over limestone, Organic Soil, Rendzina, Lithosols.

Aquatic habitats: Intermittent swamps and ponds, adjacent river. [Hainault 1969]

References

- Falls, J.B., I.D. Macdonald and T.J. Beechey. 1990. Catalogue of IBP/CT Areas in Ontario with an Assessment of their Current Conservation Status. Unpublished report. 94 pp.

- Hainault, R. 1969. International Biological Programme, Checksheet for Region 5, Area 100: Abraham's Head.

BUTTON BAY- WETLAND

AREA_ID: 9866

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	95.0 ha	18,389600,4887800	31C/1

Description
A Provincially significant wetland, composed of two wetland types (2% swamp and 98% marsh) (Mosquin and Wilson, 1986).

Vegetation
Vegetation Communities (Mosquin and Wilson, 1986):
One form
M: submergents- Vallisneria americana;
M: narrow-leaved emergents- Juncus sp./ Carex sp.;
M: robust emergents- Typha sp.;

Two forms
M: robust emergents- Scirpus validus; Myriophyllum sp.;
M: narrow-leaved emergents- Carex sp.; Lythrum salicaria;
S: deciduous trees- Salix sp.; Typha sp.;

Three forms
M: moss- Sagittaria sp.; Sparganium sp.; Lemna minor;
M: moss- Sagittaria sp.; Lemna minor; Myriophyllum sp.;

Representation

Landform
Soils (Mosquin and Wilson, 1986): 90% clays, loams or silts, and 10% organic;
Site Type (Mosquin and Wilson, 1986): 100% riverine;

References

- Mosquin, T. and J.R. Wilson. 1986. Wetland Data Record and Evaluation- Button Bay. Second Edition. Aug. 1986. Mosquin Bio- Information. Manuscript. 22 pp + 5 pp supplement.

WOLFE ISLAND WETLAND COMPLEX

AREA_ID: 7588

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	1398.0 ha	18,390000,4895000	31C/1

Description
A Provincially significant, Coastal wetland complex, made up of 12 individual wetlands (Bayfield Bay Marsh, Reeds Bay, Lewis Bay, Big Sandy Bay, Oak Point, Barrett Bay, Sand Bay, McDonell Bay, and Button Bay), composed of three wetland types (2% bog, 20% swamp and 78% marsh) (Mosquin et al., 1986).

Vegetation
Vegetation Communities (Mosquin et al., 1986):
One Form
M1: submergents;
M1: robust emergents;
M1: narrow-leaved emergents;

Two Forms
M2: robust emergents; broad-leaved emergents;
M2: narrow-leaved emergents; herbs;
M2: robust emergents; submergents;
M2: narrow-leaved emergents; broad-leaved emergents;
M2: free-floating plants; submergents;
M2: floating plants; submergents;
M2: narrow-leaved emergents; free-floating plants;
M2: robust emergents; free-floating plants;
M2: narrow-leaved emergents; submergents;
M2: robust emergents; narrow-leaved emergents;
S2: deciduous trees; herbs;
S2: deciduous trees; robust emergents;

Three Forms
M3: robust emergents; floating plants; submergents;
M3: narrow-leaved emergents; free-floating plants; submergents;
M3: robust emergents; narrow-leaved emergents; herbs;
M3: floating plants; free-floating plants; submergents;
M3: narrow-leaved emergents; floating plants; submergents;
M3: broad-leaved emergents; narrow-leaved emergents; free-floating plants;
M3: broad-leaved emergents; free-floating plants; submergents;
S3: tall shrubs; broad-leaved emergents; herbs;
S3: tall shrubs; broad-leaved emergents; free-floating plants;
S3: deciduous trees; narrow-leaved emergents; herbs;
S3: deciduous trees; tall shrubs; herbs;
S3: tall shrubs; narrow-leaved emergents; herbs;
B3: tall shrubs; herbs; mosses;

Four Forms
S4: dead trees; broad-leaved emergents; narrow-leaved emergents; free-floating plants;
S4: tall shrubs; broad-leaved emergents; dead trees; free-floating plants;
S4: deciduous trees; tall shrubs; herbs; dead shrubs;
S4: tall shrubs; robust emergents; herbs; free-floating plants;
S4: tall shrubs; dead shrubs; narrow-leaved emergents; herbs;
S4: tall shrubs; robust emergents; narrow-leaved emergents; herbs;
M4: tall shrubs; robust emergents; narrow-leaved emergents; herbs;
M4: robust emergents; narrow-leaved emergents; free-floating plants; submergents;
M4: robust emergents; floating plants; free-floating plants; submergents;

Five Forms
S5: deciduous trees; tall shrubs; broad-leaved emergents; herbs; mosses;

B5: coniferous trees; tall shrubs; dead shrubs; herbs; mosses;

Representation

Landform
Soils (Mosquin et al., 1986): 70% clays, loams or silts and 30% organic;
Site Type (Mosquin et al., 1986): 1% palustrine, 69% riverine, 1% lacustrine at rivermouth, 25% lacustrine on enclosed bay, and 4% lacustrine exposed to lake;

References

- Mosquin, T., J.R. Wilson and D. White. 1986. Wetland Data Record and Evaluation- Wolfe Island Wetland Complex. Second Edition. August, 1985 and May- September, 1986. Mosquin Bio-Information/ Environmental Applications Group. Manuscript. 17 pp + 1 map + 7 pp supplement.

BAYFIELD BAY MARSH

AREA_ID: 9891

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	506.0 ha	18,390000,4894500	31C/1

Description
A Provincially significant wetland, composed of two wetland types (3% swamp and 97% marsh) (Mosquin and Wilson, 1986).

Vegetation
Vegetation Communities (Mosquin and Wilson, 1986):
One form
M: robust emergents- Typha angustifolia;
M: submergents- Myriophyllum sp./ Vallisneria americana;
M: narrow-leaved emergents- Sparganium sp.;

Two forms
M: robust emergents- Scirpus validus; Myriophyllum sp.;
M: robust emergents- Typha sp.; Lemna minor;
M: free-floating plants- Nymphaea sp.; Utricularia vulgaris;
M: narrow-leaved emergents- Sparganium sp.; Utricularia vulgaris;
M: narrow-leaved emergents- Carex sp.; joe-pye weed;

Three forms
M: robust emergents- Typha sp.; Sparganium sp.; Lythrum salicaria;
M: deciduous trees- Salix sp.; Cornus sp.; jewelweed;
M: free-floating plants- Nymphaea sp.; Lemna minor; Utricularia sp.;
S: tall shrubs- Salix sp.; grasses; jewelweed;
M: narrow-leaved emergents- Sparganium sp.; Nuphar sp.; Myriophyllum sp.;

Four forms
M: robust emergents- Typha sp.; Nuphar sp.; Lemna triscula; Utricularia sp.;
S: tall shrubs- Cornus sp.; Typha sp.; Carex sp.; Lythrum salicaria;

Representation

Landform
Soils (Mosquin and Wilson, 1986): 51% clays, loams or silts, and 49% organic;

Site Type (Mosquin and Wilson, 1986): 100% riverine;

References

- Mosquin, T. and J.R. Wilson. 1986. Wetland Data Record and Evaluation- Bayfield Bay Marsh. Second Edition. Aug 1986. Mosquin Bio-Information. Manuscript. 22 pp.

OAK POINT- WETLAND

AREA_ID: 9889

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	19.0 ha	18,393500,4898500	31C/1

Description
A Provincially significant wetland, composed of one wetland type (100% marsh) (White, 1986).

Vegetation
Vegetation Communities (White, 1986):
Marsh
M1: robust emergents- Typha sp.; Lemna sp.; Hydrocharis sp.; Carex sp.;
M2: submergents- Myriophyllum sp.;
M3: robust emergents- Scirpus sp.; Vallisneria sp.;
M4: free-floating plants- Lemna sp.; Hydrocharis sp.; Typha sp.; Sparganium sp.;

Representation

Landform
Soils (White, 1986): 60% clays, loams or silts, and 40% organic;
Site Type (White, 1986): 30% palustrine (permanent or intermittent outflow), and 70% riverine;

References

- White, D. 1986. Wetland Data Record and Evaluation- Oak Point. Second Edition. July 23, 1986. Environmental Applications Group. Manuscript. 22 pp + 1 pp supplement.

- White, D., and J. Sparling. 1987. Evaluation of 26 wetlands in Napanee and Tweed Districts Eastern Region. Part 1- Summary Report. The Environmental Applications Group Limited. 65 pp + iii pages (includes VC mapping for each wetland).

LEWIS BAY- WETLAND

AREA_ID: 9848

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	11.0 ha	18,398500,4896000	31C/1

Description
A Provincially significant wetland, composed of one wetland type (100% marsh) (White, 1986).

Vegetation
Vegetation Communities (White, 1986):
Two forms
M2: submergents- Vallisneria sp.; Myriophyllum sp.;
M3: robust emergents- Typha sp.; Sparganium sp.;

Three forms
M1: free-floating plants- Lemna sp.; Hydrocharis sp.; Vallisneria sp.;

Representation

Landform
Soils (White, 1986): 100% organic;
Site Type (White, 1986): 30% palustrine (permanent or intermittent outflow), and 70% riverine;

References

- White, D. 1986. Wetland Data Record and Evaluation- Lewis Bay. Second Edition. July 23, 1986. Environmental Applications Group. Manuscript. 22 pp + 6 pp supplement.

- White, D., and J. Sparling. 1987. Evaluation of 26 wetlands in Napanee and Tweed Districts Eastern Region. Part 1- Summary Report. The Environmental Applications Group Limited. 65 pp + iii pages (includes VC mapping for each wetland).

WOLFE ISLAND - BEAUVAIS POINT

AREA_ID: 7335

Significance	Area Type	Size	Centroid UTM	Map #
	International Biological Program site	5.5 ha	18,405600,4898300	31C/1

Description
7E5 (6-15); flat to terraced limestone plain forming a headland in St., Lawrence River; well developed forest, with surrounding successional thickets and meadows (3 communities); temperate and southern biota, with regionally rare flora; increasing cutting and cottages disturbances; OMNR-E, I.D. Macdonald. [Falls et al. 1990]

Vegetation
Vegetation Summary:
1A21: forest; Quercus alba - Carya ovata; F2; rendzina; 3.7 ha.
1J21: savanna; Crataegus spp.; F2; clay loam; 0.7 ha.
1M21: hay field; F2; clay loam; 1.1 ha. [Hainault 1969]

Representation
Special biological features: This may be the least disturbed oak-hickory forest in the area. [Hainault 1969]

Landform
Landscape description: Flat limestone plain on narrow point.

Major soils: Rendzinas, Clay loams.

Aquatic habitats: None.

Special physical features: Peculiar erosion patterns on limestone. [Hainault 1969]

References

- Falls, J.B., I.D. Macdonald and T.J. Beechey. 1990. Catalogue of IBP/CT Areas in Ontario with an Assessment of their Current Conservation Status. Unpublished report. 94 pp.

- Hainault, R. 1969. International Biological Programme, Checksheet for Region 5, Area 99: Beauvais Point.

BEAUVAIS POINT **AREA_ID: 1050**

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Life Science ANSI	8.0 ha	18,405700,4898200	31C/1

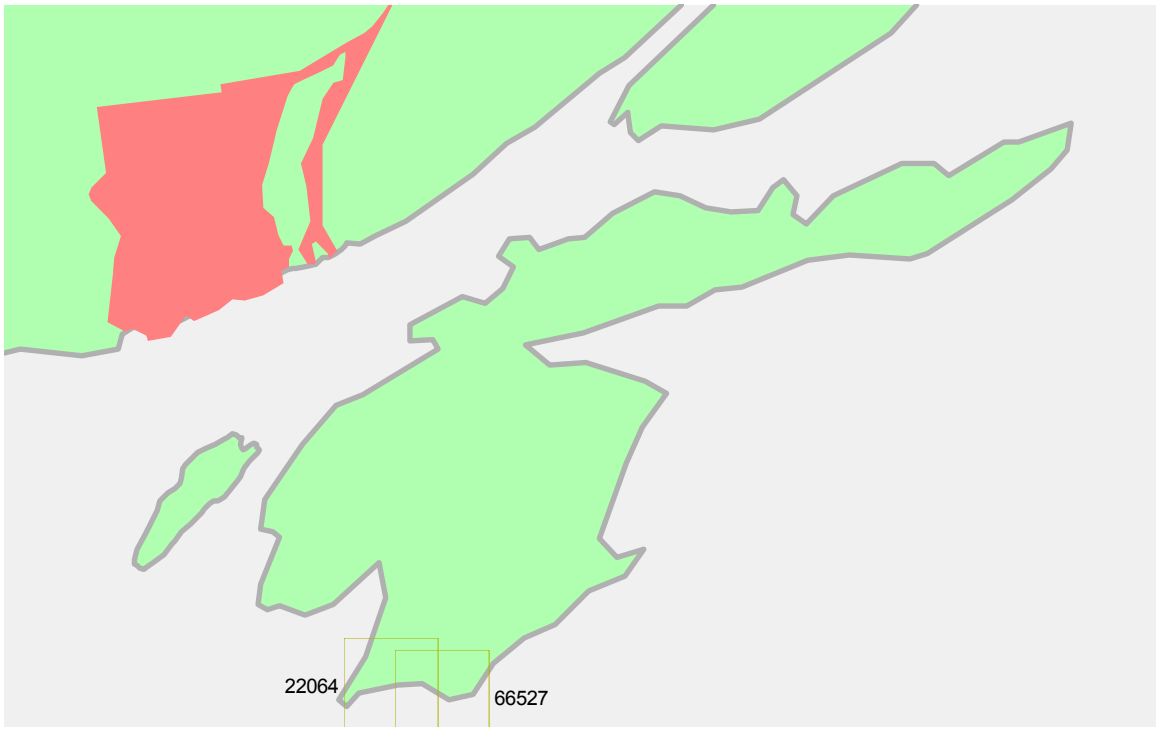
Description
Limestone plain with small upland deciduous forest of sugar maple - red oak of submature age; supports several regionally and provincially rare plant species; generally disturbed by medium cutting and grazing. [Macdonald 1987]

Vegetation
Representation
Landform

References

- Macdonald, I.D. 1987. Life Science Areas of Natural and Scientific Interest in Site District 6-15. Draft. Ontario Ministry of Natural Resources, Eastern Region, Kemptville. SR OFER 8603. viii + 149 pp.

Vegetation Communities



EO_ID: 22064
Common Name: Graminoid Coastal Meadow Marsh Type **Grank:** G2? **Srank:** S2
Centroid: 18,385000,4885000 **Accuracy:** 3 **Datum:** NAD27

LOCATIONAL INFORMATION:
Loc. Name: Wolfe Island Big Sandy Bay **Nat. Area** WOLFE ISLAND BIG SANDY BAY
Map Number: 31C/1
Habitat: This is an extensive sandy bay complex formed on a level, relatively flat limestone shoreline. There is excellent development of peatland heath and forest complexes have occurrred behind the sand dunes. Soil types vary from fibrous muck through peat to sand.

COMMUNITY SPECIFIC INFORMATION:
System: LACUSTRINE **PhysiogType:** HERBACEOUS **Size (ha):** 500.0 **EORank:**

Dominant Species:

Other Species: Cladium mariscoides - Eleocharis sp.

Description:

Survey Date: **Survey Type:** Qualitative

EO_ID: 66527
Common Name: Little Bluestem - Switchgrass - Beachgrass Dune Grassland Type **Grank:** G? **Srank:** S2
Centroid: ,, **Accuracy:** 3 **Datum:** NAD27

LOCATIONAL INFORMATION:
Loc. Name: **Nat. Area**
Map Number: 31C/1
Habitat:

COMMUNITY SPECIFIC INFORMATION:
System: **PhysiogType:** **Size (ha):** **EORank:**

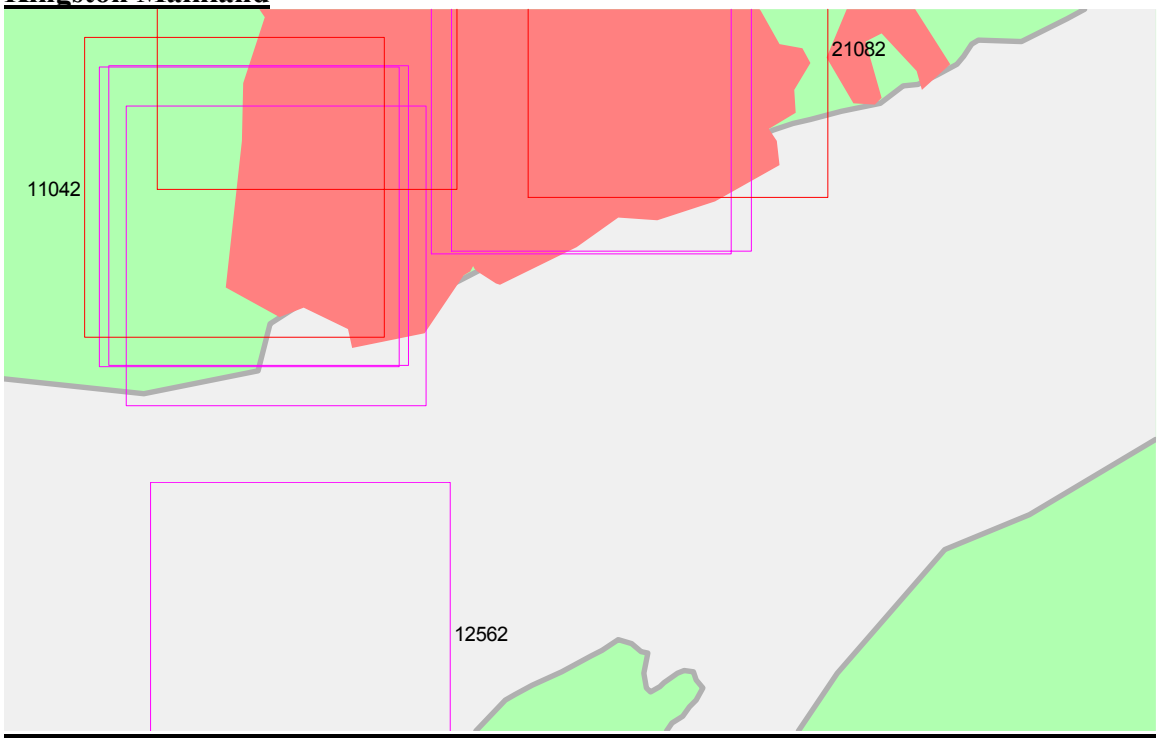
Dominant Species:

Other Species:

Description: **Survey Date:** **Survey Type:**

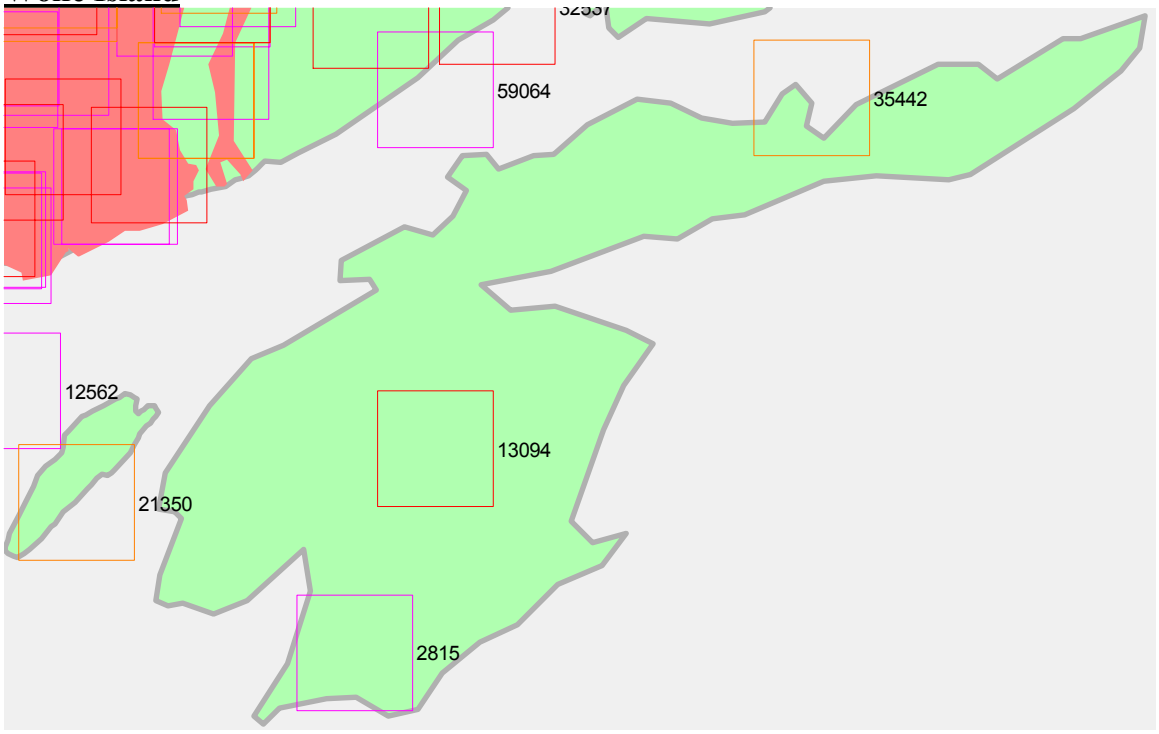
Rare Species

Kingston Mainland



Scientific Name		Common Name	UTM Centroid (rounded)	Srank	MNR	COSEWIC	Date
3557	Sparganium androcladum	Branching Bur-reed	18 377000 4898000	S1			1897-07-15
11042	Rallus elegans	King Rail	18 377000 4898000	S2B,SZN	END-R	END	1956-05-04
12082	Chlidonias niger	Black Tern	18 377000 4898000	S3B,SZN	SC	NAR	1991-06-27
13047	Ammodramus henslowii	Henslow's Sparrow	18 378000 4900000	S1B,SZN	END-R	END	1950-06-01
13047	Ammodramus henslowii	Henslow's Sparrow	18 379000 4900000	S1B,SZN	END-R	END	1973-05-26
59021	Sparganium androcladum	Branching Bur-reed	18 377000 4898000	S1			1897-07-15
12562	Nycticorax nycticorax	Black-crowned Night-heron	18 377000 4894000	S3B,SZN			1991-05-15

Wolfe Island



Scientific Name		Common Name	UTM Centroid (rounded)	Srank	MNR	COSEWIC	Date
2815	Peltandra virginica	Arrow-arum	18 384000 4886000	S2			1971-08-05
13094	Ammodramus henslowii	Henslow's Sparrow	18 387000 4891000	S1B,SZN	END-R	END	1950
21350	Ixobrychus exilis	Least Bittern	18 378000 4891000	S3B,SZN	THR	THR	1911-06-11
35442	Urocyon cinereoargenteus	Grey Fox	18 398000 4898000	SZB?	THR	THR	1979-01-31