ENVIRONMENTAL ASSESSMENT REGISTRATION

ST. JOHN'S WIND FARM

Submitted by:

ANEMOS ENERGY CORPORATION

Submitted to:

Environmental Assessment Division
Department of Environment and Conservation
Government of Newfoundland and Labrador

November, 2004

On the cover: Photo of a wind farm from the Canadian Wind Energy Association's Photo Gallery. Origin unknown.

1 NAME OF UNDERTAKING

The name of the undertaking is St. John's Wind Farm.

2 PROPONENT

2.1 Name of Corporate Body

ANEMOS ENERGY CORPORATION will undertake the project. ANEMOS ENERGY was federally incorporated according to the terms of the *Canada Business Corporations Act* in July, 2004. The company's vision is to develop environmentally responsible power generation projects which utilize renewable resources and produce zero greenhouse gas emissions. Its objectives are sustainable, long term growth while producing economic benefit to the jurisdictions or regions which are selected for development. The subject undertaking is the company's first endeavour.

2.2 Address

The address of the corporation is
1-112 Herkimer Street
Hamilton, Ontario, L8P 2G7

2.3 Chief Executive Officer

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Official Title:	President and Chief Executive Officer
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2.4 Principal Contact Person for Purposes of Environmental Assessment

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3 THE UNDERTAKING

3.1 Nature of the Undertaking

ANEMOS ENERGY proposes to develop, install, operate and maintain an array of wind turbines (wind farm) with the purpose of generating electricity which will be sold to Newfoundland Power for distribution and resale to customers. The wind farm will be located on the east coast of the Avalon Peninsula within the municipal boundaries of The City of St. John's. The wind farm is expected to have an installed rated output of 10 megawatts (MW) consisting of five to ten turbines of 1 to 2 MW rated output each. Construction is anticipated to take place between spring and fall of 2006 with operation beginning late in 2006.

3.2 Rationale for the Undertaking

Power generated by fossil fuel combustion has traditionally been among the most economical sources of electricity in North America due to the low cost of the fossil fuel. However, as the cost of some forms of fossil fuels (oil and natural gas) increases due to decreasing reserves, other types of power generation have become more attractive. Wind power is one of these options. Wind energy is not subject to the same price volatility as fossil fuel supplies, and the long term availability of the resource is not an issue, unlike the global reserves of oil and natural gas. The cost of wind energy production is approximately stable throughout the entire life of a wind farm; up to 25 years.

Strong government support in wind power production in the western European community has resulted in maturation of wind turbine technology, so that the latest generation of available wind turbines are more efficient and reliable than previous generations. The result is that they are more competitive on a cost/kWh basis than they were in the past compared to fossil fuel power plants.

Also, provincial and federal governments of Canada have pledged - through implementation of various incentive programs and enactments of legislation aimed at environmental protection and pollution reduction - to decrease the country's reliance on electricity generated by fossil fuel combustion and to increase the availability of power generated by renewable resources. The federal government has also committed to purchasing 20% of the power it consumes from green sources. Other levels of government throughout Canada are following this example.

In addition, there is growing public concern over the state of the environment and emissions of hydrocarbon based pollutants into the atmosphere. Unlike electricity generated from fossil fuel combustion, there are no emissions of smog, greenhouse gases, particulate matter or acid rain-creating pollutants associated with wind generated electricity. Also, unlike nuclear energy, there are no concerns regarding the disposal of spent fuel. Wind energy is an environmentally clean source of electricity.

The electricity supplied by the proposed wind farm would primarily displace electricity generated by the Holyrood Thermal Generating Station. At an anticipated average annual production of 32,000 MWh for the subject 10 MW wind farm, the annual pollution from the combustion of more than 8,000,000 litres of fuel oil could be avoided. This would represent a substantial reduction in greenhouse gas emissions, equivalent to approximately 30,000 tons of CO_2 annually.

In Canada, particularly along the coastal areas of Newfoundland, wind is a readily available and highly energetic resource. Wind power will be easily integrated into the provincial electrical grid because the windy season coincides with the season of peak electrical demand. Thus, wind energy is a viable and attractive means of meeting the island's increasing electricity load. While Newfoundland does not yet have an operating grid connected utility-sized wind farm, three wind farms are under development in the province. The first project is the St. Lawrence Wind Demonstration Project, the second is the Burnt Ridge, Elliston, Bonavista Peninsula Wind Farm and the third is The Arches and Flat Hills Wind Farm. Other projects are in operation or proposed for

the island but these are generally isolated (not grid connected) wind diesel plants of less than 500 kW rated output.

4 DESCRIPTION OF THE UNDERTAKING

4.1 Geographic Location

The proposed wind farm will be located on an area of land approximately 2.5 km^2, approximately 21 km south of St. John's city center and approximately 9 km north east of the town of Bay Bulls, between provincial Route 10 (known locally as Bay Bulls Road or Southern Shore Route) and the east coast of the Avalon Peninsula on the island of Newfoundland. The general location of the proposed project site is shown in figure 4.1. The site is in close proximity to a Newfoundland Power substation located at the north east end of Bay Bulls Big Pond and an existing gravel road (known locally as Shoal Bay Road) which extends south east to the coast from Route 10. These factors will minimize the length of the transmission line required for interconnection and the length of additional road construction necessary for site access, respectively. Details of the proposed project and surrounding topography can be seen in figure 4.2.

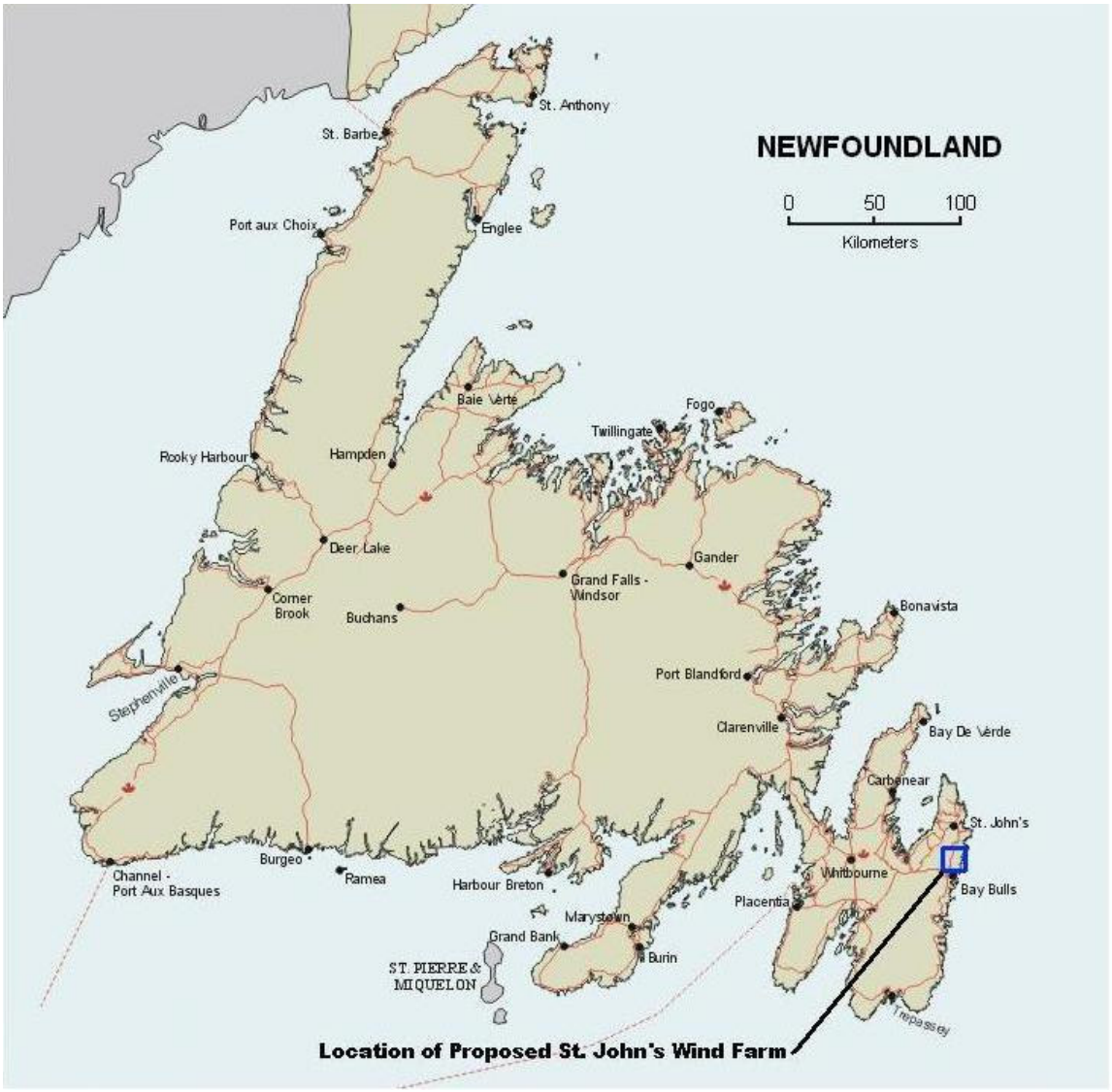

Figure 4.1 Map of the Island of Newfoundland indicating the location of the proposed undertaking.

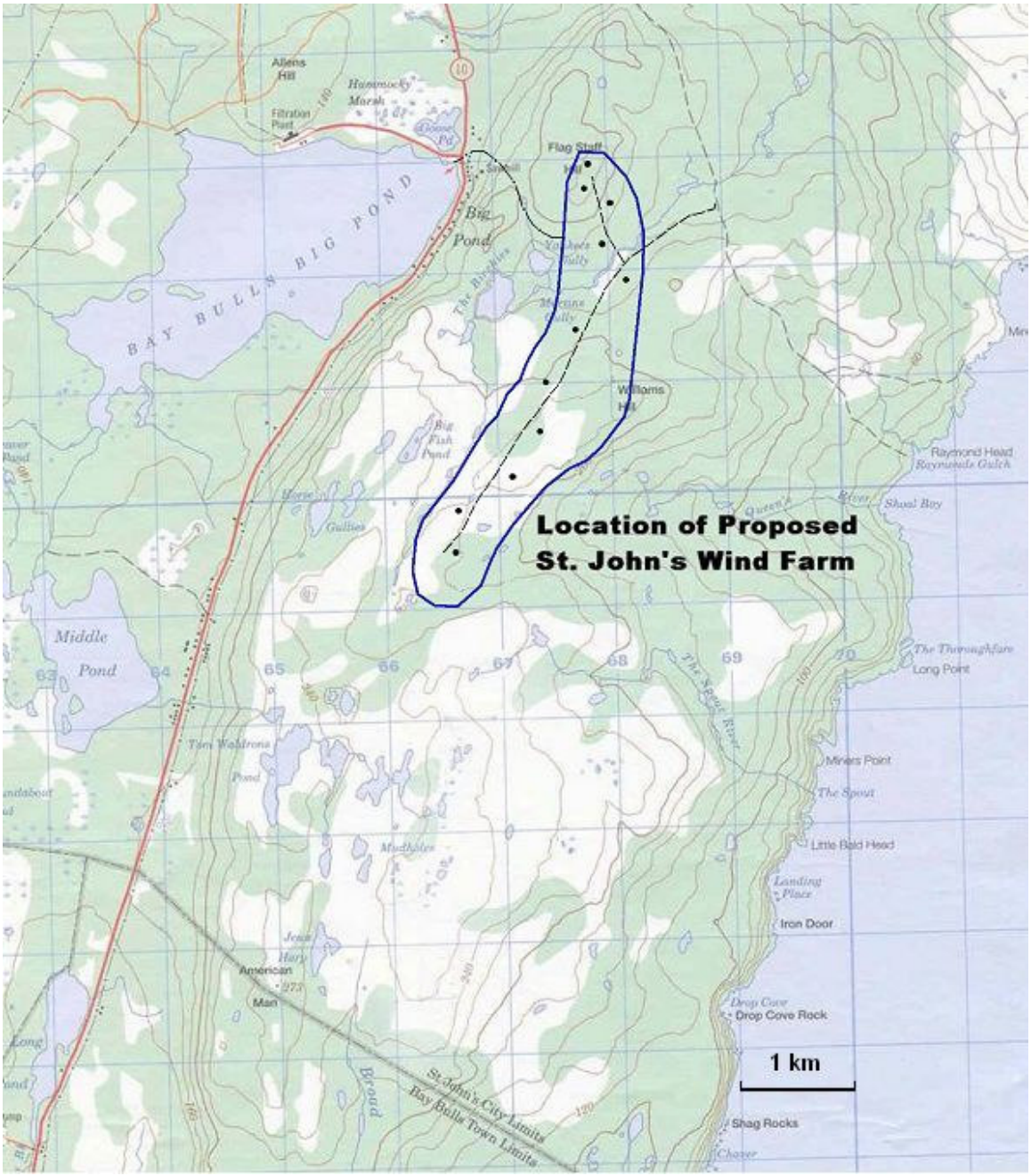

Figure 4.2 Proposed site plan and surrounding topography.

4.1.1 Site Layout

Initially, a 50 meter tall, guyed wind monitoring tower will be erected at the site to collect data during a one year period. The data obtained will specify the area's wind characteristics and will be used for turbine specification, turbine micro-siting and energy generation calculations. The indicated locations of the wind turbines are therefore preliminary. Final location will be determined by the results of the wind monitoring study as well as geographic constraints of the site. It is important to note this layout is subject to change once all the required information is gathered and analysed. For example, the number of turbines will depend on the rated output of the wind turbine model selected and on details of the power purchase agreement to be negotiated.

4.1.2 Ecological Considerations and Land Use

The site was chosen with careful consideration of its proximity to the ecologically important areas of Bay Bulls Big Pond and the East Coast Trail, the latter which runs in a north south direction along the coast line to the east of the site. Bay Bulls Big Pond is a primary water supply reservoir for the City of St. John's but the site lies outside the municipally defined watershed zone surrounding Big Pond, and will not threaten the quality of water contained in the reservoir. The East Coast Trail is an important recreational corridor and tourist attraction for the region, but the site will not detract from the natural environment adjacent to the coastline through which the Trail passes. Trail users will likely not even be aware of the presence of the wind turbines since at least 2 km of distance and dense forestation lie between the Trail corridor and the site.

Typically, the wind turbine foundations and service roads occupy less than 2% of the land which a wind farm occupies. The turbines will be spaced a minimum of 150 metres apart and the land areas between each turbine will be available for use as before. The wind farm will be located at least 1 km away from the closest residences situated along Route 10, and more than 2 km away from the East Coast Trail. Its presence should present minimal conflict with existing land uses and potential farming and forestry land uses. The proposed site shows very little signs of being extensively used and is noted to be only infrequently used for berry picking, hiking, and small game hunting. The presence of the turbines will affect only the latter pursuit in that the use of firearms will be limited. Furthermore, the existing gravel road extending from Route 10 to the coast is currently passable by high clearance four wheel drive or all terrain vehicles only. Improvement of this road and addition of the gravel roads required to access the wind turbines will enhance access to the area for local residents and tourists. Two particular benefits will be improved access to the East Coast Trail and additional parking for Trail users, both of which will encourage use.

4.2 Physical Features

4.2.1 Major Physical Features of the Undertaking

The three primary components of a wind farm are the wind turbine generators, access roads and transmission lines.

4.2.1.1 Wind Turbine Generators

The wind farm will consist of five to ten wind turbine generators of 1 to 2 MW rated output each generating a total rated output of 10 MW. Final selection of the turbine model has not yet been made, but those under consideration are horizontal axis machines with hub heights ranging from 50 m to 100 m and rotor diameters between 52 m and 80 m.

The major components of a turbine consist of a foundation, a tubular tower, the nacelle and the rotor. These are shown schematically in figure 4.3 below.

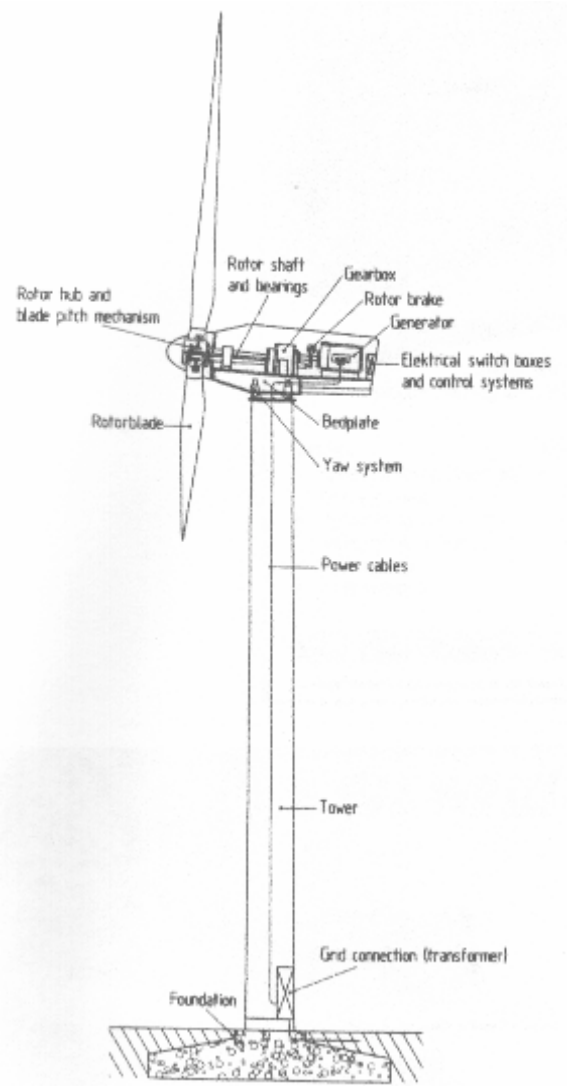

Figure 4.3 Schematic drawing of a horizontal axis wind turbine generator.

The foundation design is dependent on soil tests to be performed at the site. A standard gravity foundation made of concrete reinforced steel will be used. The diameter will be approximately 10 to 20 m and the depth 2 to 6 m depending on the turbine model selected. The turbines will be transported to the site in sections, where a mobile crane will erect each tower then lift and install the nacelle and rotor. Adjacent to each turbine tower base, a small transformer occupying a footprint of up to nine square meters will be located.

4.2.1.2 Access Roads

The existing gravel road, known locally as Shoal Bay Road, extending in a south east direction from Route 10 just south of Raymond Brook to the coast will be improved, graded and widened to approximately 4.5 m as necessary. An extension will be required to access the site, and this will branch into short individual lengths of road to each turbine. See figure 4.2 for possible routing. Note that the actual routing of the roads, aside from Shoal Bay Road which already exists, will be dependent on the eventual locations of each turbine. These locations will be determined by geographic constraints and the wind monitoring study, as discussed above in section 4.1.1.

4.2.1.3 Transmission Lines

Each wind turbine will be connected to a small medium voltage transformer situated within several meters of the turbine tower base. The electricity generated by each turbine is expected to be at 400 to 600 volts, depending on the model selected, which will be increased to 12.5 kV or 66 kV by the transformers. The electricity from each medium voltage transformer will then be collected at the site intertie point for transmission to the Newfoundland Power substation at the north east end of Bay Bulls Big Pond. The cables connecting the medium voltage transformers to the intertie point will run underground through cable trenches or conduits and will follow the routes of the access roads. A transmission line will deliver the collected electricity at a line voltage of 12.5 kV or 66 kV from the intertie point to the Newfoundland Power substation for interconnection to the grid. It will run above ground and will be supported by wooden poles or steel lattice structure transmission towers. It is anticipated that the line will not follow the route of the access road but will instead take a more direct path to the Newfoundland Power substation and will consequently require clearing of growth. However, the clearing will be undertaken only to an extent which will allow installation of the line and supporting poles or towers, and which will prevent damage to the line during the life of the wind farm. The proposed route of the transmission line is depicted in figure 4.2. Final routing will depend on geographic constraints and property rights along Route 10.

4.2.2 Physical and Biological Environments

The proposed site is located within the South Eastern Barrens Sub Region of the Maritime Barrens Ecoregion, as defined by the Department of Natural Resources, Government of Newfoundland and Labrador. The Maritime Barrens Ecoregion extends from the east coast of Newfoundland to the west coast through the south central portion of the island. This ecoregion has the coldest summers with frequent fog and strong winds. Winters are relatively mild with intermittent snow cover particularly near the coastline. Annual precipitation exceeds 1250 mm. The Ecoregions of Newfoundland are shown below in figure 4.4.

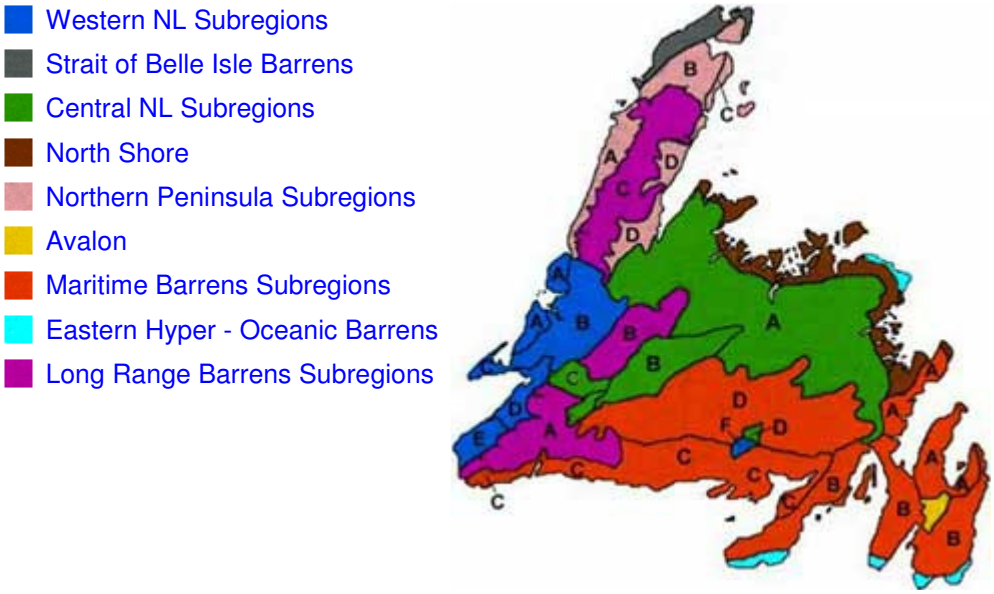

Figure 4.4 Ecoregions of Newfoundland.

In the South Eastern Barrens Sub Region the landscape is dominated by heathlands and the forest only occurs in small acreages which escaped fire. The dominant heath shrub on uplands is *Empetrum nigrum* with *Kalmia angustifolia* forming a dense cover only in protected valleys.

The topography of the Sub Region is generally undulating with shallow heavily compacted till and

numerous large erratics. Rock is a mixture of sedimentary and granites. The Clintonia-Balsam Fir type is the dominant tree species where the forest is still present. Good forest growth only occurs in a few large protected valleys where the Dryopteris-Balsam Fir type dominates the slopes. Good specimens of Yellow Birch are also found in these stands. (Forest Resources Branch, Department of Natural Resources, Government of Newfoundland.)

The site of the proposed project is at an elevation of between 200 to 220 m above sea level. The nearest bodies of water are Big Fish Pond approximately 500 m to the east, the head of Queen's River approximately 600 m to the west and other smaller, unnamed ponds and bogs in the area. A section of Martins Gully lies within the site boundaries. See figure 4.2 above. Aerial photos of the proposed site are shown below in figures 4.5 through 4.8.

Figure 4.5 Aerial view of proposed site, looking east.

Figure 4.6 Aerial view of proposed site, looking NNE. Williams Hill is in the center of the photo. The small ponds in the foreground are not named on the map.

Figure 4.7 Aerial view of proposed site, looking south. Bay Bulls Big Pond and Route 10 can be seen in the upper right. Flag Staff Hill is in the center of the photo.

Figure 4.8 Aerial view of proposed site, looking southwest. The gravel path extending from Shoal Bay Road can be seen. This will serve as the site access road.

4.2.2.1 Wildlife

During construction of the wind farm, land mammals will be displaced from the area due to disturbances created by operating construction equipment and personnel. However, aside from access road construction, most of the land area between each turbine will remain essentially undisturbed. If trees are cleared, grass will be planted. Subsequent to the construction period, during normal operation of the wind farm, it is expected that mammals will re-occupy the area, and they will be able to move throughout the site unobstructed. Mammals that are resident on the Avalon Peninsula which are likely present in the area of the proposed site and may be affected are listed below (Mac Pitcher, personal communication). None of these mammals are considered threatened or endangered as defined by Environment Canada.

Moose *(Alces Alces)* - Found along the margins of ponds, lakes and rivers of the boreal forest, swamps and bogs. They can also be found in fresh water feeding.

Caribou *(Rangifer Tarandus)* - Although resident on the Avalon Peninsula, likely would not be encountered in the area of the proposed site.

Masked Shrew *(Sorex cinereus)* - Populations show a dramatic cycling, and in this area apparently peak at four year intervals, with the last peak occurring during 2001. Current population is low.

Little Brown Bat *(Myotis lucifugus)* - Commonly encountered from May to at least September throughout the area. Although no wintering colonies have been recorded, it is assumed that most if not all individuals are year-round residents.

Meadow Vole *(Microtus pennsylvanicus)* - A highly cyclical species common throughout the area. Numbers apparently peak at approximately four year intervals. Population peak occurred in 2002 and is currently low.

Muskrat (*Ondatra zibethicus)* - Present throughout the area, but in low numbers.

Beaver *(Castor canadensis)* - Present in low numbers in suitable habitat throughout the area. It appears that the lack of suitable habitat is the major limiting factor of beaver in the area.

Red Squirrel *(Tamiasciurus hudsonicus)* - Present in moderate to high numbers in all forested areas, including the dwarf coniferous Krummholz on the higher elevations. Numbers appear higher following years of good conifer cone crop production.

Eastern Chipmunk *(Tamias striatus)* - Present in suitable mixed woods habitat.

Snowshoe Hare *(Lepus americanus)* - Found throughout the area except on sparsely-vegetated uplands. Highly cyclical with peak in 2000 but low numbers at present.

Red Fox *(Vulpes)* - Uncommon to common throughout the area, but more prevalent in open peatland and upland areas.

Canada Lynx *(Felis lynx)* - Uncommon resident of the area, present in most forested areas. Population is presently low to moderate due to low hare numbers. Population shows dramatic peaks at 7 - 10 year intervals.

River Otter *(Lontra canadensis)* - Although rarely seen, a common resident with apparently stable numbers.

Mink *(Mustela vison)* - Presently it is widespread and in moderate numbers throughout the area. Population density appears to be highest in coastal areas.

Short-tailed Weasel *(Mustela erminea)* - Common resident, found throughout the area in all suitable habitat. Numbers fluctuate in response to population density of chief prey species (*Microtus pennsylvanicus)*.

Black Bear *(Ursus americanus)* - It is doubtful that the species is a resident and can best be considered an occasional transient.

Most ponds in the area have populations of Brook Trout and Threespine Stickleback. These will be affected only if their natural habitat is disturbed during construction of the wind farm. There are ponds and streams some distance from the site as described previously, and a section of Martins Gully lies within the area of the proposed site. However, the effect on fish can be considered marginal or nonexistent.

Of greater concern is the effect of the wind farm on bird populations. Possible effects vary from loss or disruption of habitat to actual mortality due to collisions with the wind turbine towers and rotating blades. Studies have shown that avian collisions with wind turbines are not as significant as with other structures, such as transmission lines and windowed buildings (National Wind Coordinating Committee, 2001). This is discussed further in section 4.4.5 below.

As with other wind power projects which have previously been registered for environmental assessment and subsequently received conditional release from further review, a bird monitoring study specific to the project will be devised and implemented during its operation. At this stage, an overview of species that can be found in the area of the proposed site is presented. Bird species that have been sighted at several sites around the north east Avalon Peninsula from November 2003 to November 2004 are listed below (National Audubon Society). The list is based on observations recorded by recreational birders at sites near Witless Bay, Torbay, St. John's and Portugal Cove and may include fewer or more species than will be found at the proposed site.

American Black Duck	Common Loon	Mourning Dove	Ruby-crowned Kinglet
American Goldfinch	Common Murre	Northern Flicker	Savannah Sparrow
American Crow	Common Redpoll	Northern Fulmar	Sharp-shinned Hawk
American Robin	Dark-eyed Junco	Northern Pintail	Spotted Sandpiper
Atlantic Puffin	Eurasian Wigeon	Northern Shrike	Spruce Grouse
Bald Eagle	European Starling	Osprey	Thick-billed Murre
Black-capped Chickadee	Evening Grosbeak	Pine Grosbeak	Tree Swallow
Black Guillemot	Fox Sparrow	Pine Siskin	Yellow Warbler
Black-headed Gull	Great Black-backed Gull	Purple Finch	Yellow-rumped Warbler
Blackpoll Warbler	Green-winged Teal	Razorbill	White-crowned Sparrow
Blue Jay	Hairy Woodpecker	Red-breasted Nuthatch	White-throated Sparrow
Boreal Chickadee	Magnolia Warbler	Ring-necked Duck	White-winged Crossbill
Brown Creeper	Mallard	Rock Dove	Willow Ptarmigan

4.3 Construction

4.3.1 Construction Period and Start Date

Construction of the wind farm will take 6 to 9 months and will be undertaken during the period from April to October to avoid winter conditions. The start date of construction is contingent on completion of the wind monitoring study, granting of all necessary permits, negotiation of the power purchase agreement and obtaining necessary financing. However, it is anticipated that construction will begin in the spring of 2006 with operation of the first turbine to occur late in the summer or autumn of 2006.

4.3.2 Construction Activities

Essentially, construction activities will consist of clearing vegetation, building access roads, excavating for and installing underground cable, excavating for and constructing the tower foundations, installing the turbine towers, nacelles and rotors and erecting the poles or towers for the transmission line to the Bay Bulls Big Pond substation.

During the construction period, temporary buildings for offices and equipment storage will be installed at the site. Following construction, cleared land will be planted with grass to beautify the site and minimize erosion.

4.3.3 Potential Sources of Pollution During Construction

During the construction period, potential sources of pollution include inadvertent spills of human waste or leakage of lubricating oil, fuel or coolant from construction equipment. Also, emissions of exhaust gasses from construction vehicles and machinery. Otherwise, no harmful waste or pollutant will be discharged into the environment.

Noise levels are expected to increase during the construction period. Road graders, construction equipment, cranes and increased traffic will be the major sources. However, it is expected that local residents will be minimally affected, since the nearest residences are at least 1 km from the site.

4.3.4 Mitigation Measures During Construction

All normal precautionary measures and standard construction practices will be implemented to minimise disturbance to the site, control runoff and sedimentation, reduce noise levels, avoid oil or fuel spills, and to collect waste.

The project proponent will allow only construction and crane equipment in good repair on site. Emergency response spill kits will be maintained on site to contain any spill of hazardous fluids. Waste collection bins and self contained toilets will be installed.

4.3.5 Potential Resource Conflicts During Construction

Recreational land use around the construction site is expected to be temporarily affected for safety and liability reasons. Since the wind turbines will be installed systematically, only a small amount of the total land area is expected to be unavailable for recreational use at the time of construction. Other land uses in the area are limited and no particular resource conflict is expected with the installation and operation of wind turbines.

- The existing gravel extension of Shoal Bay Road runs in a southeast direction from Route 10 to the coast and passes within 750 m of the proposed site. However, this road is used infrequently by local off-road vehicles and foot traffic. Passage of vehicles may be temporarily prevented during improvement of the road due to the presence of personnel and equipment; however the road will not be closed during or after construction.
- Lamanche Provincial Park is located approximately 22 km to the south west of the proposed project area and Butter Pot Provincial Park lies 21 km to the west. No interaction is predicted.
- Gull Island, the northern-most island within the Witless Bay Ecological Reserve, lies 12 km to the south of the proposed site. No interaction is predicted.
- The East Coast Trail runs along the coast line in a north south direction. At its closest proximity, it is over 2 km from the proposed site. Road graders, construction equipment, cranes and increased traffic may result in intermittent increased noise levels during the construction period. From certain points along the Trail, users may see some or all of the erected wind turbines but they will not hear the turbines operating.
- The Bay Bulls Big Pond protected watershed area lies 850 m to the west of the project site. No interaction is predicted.
- The head of Queen's River is located approximately 500 m from the site at its closest proximity. The river runs east, away from the site. No interaction is predicted.
- Martins Gully flows through the northern part of the proposed site and the gravel access road will be required to traverse it. This will be achieved by installing a culvert at a suitably narrow section and constructing the road to pass over the gully. It will not be dammed or diverted. Interaction will be limited to the construction period only. An application for Environmental Permit for Culvert Installation must be submitted to the Department of Environment and Conservation, Government of Newfoundland and Labrador.
- The nearest residences situated along Route 10 are located at least 1 km away from the site. Road graders, construction equipment, cranes and increased traffic may result in intermittent increased noise levels during the construction period. After construction is complete, no interaction is predicted.
- The proposed site lies within the municipal boundaries of the City of St. John's. This area is zoned rural and will not require a change in zoning.
- The area is used for hunting of snowshoe hare and grouse and occasional hunting of ptarmigan and moose (Mike McGrath, personal communication). Although hunting in the area will be disrupted during the construction period, the entire site will be open to this activity after construction is complete. However, subject to safe gun handling practice and provincial firearms or hunting regulations, shooting will be restricted in the vicinity of the wind turbines.
- Berry picking also occurs in the area. Construction activity may deter berry pickers, however their activity will not be restricted from areas surrounding the site. After the construction period, the entire site will be open to this activity.

4.4 Operation

4.4.1 Operation Description

Wind turbine designs vary according to manufacturer; however, generally a wind turbine consists of the rotating blades fixed around the hub, a main drive shaft, a gearbox assembly, a generator, the control cabinet located inside the base of the tower, the tower, the concrete foundation and a transformer located adjacent to the tower base. Wind turbines convert the linear kinetic energy of the wind into rotational energy. This in turn is converted to electricity by the generator housed within the nacelle. Typical utility scale wind turbines begin operating when the wind reaches

speeds between 3 and 4 m/s, the speed at which the turbine blades experience sufficient lift to turn the rotor. Rated output is generated at wind speeds of 12 to 14 m/s but they will operate at wind speeds up to 25 to 30 m/s, depending on the model. If the wind speed exceeds the maximum allowable, the turbine's control system engages the braking system to stop the unit and prevent damage.

Each wind turbine can be considered a self-controlled power unit. They are designed to operate automatically; however, they may also be manually controlled for specific situations, such as resets following turbine trips. All individual wind turbines will be controlled through a remote control centre. This centre will be located in the nearby town of Bay Bulls or in the city of St. John's. During fault conditions, automatic notification will be provided to the control centre via modem. Full diagnostics can be run from the remote control centre, as well as turbine starts and stops.

Wind project operators will make trips to the site on a semi-weekly to daily basis to ensure the turbines are in good operating condition and to survey the site. The wind turbines will undergo semi-annual scheduled maintenance, which can require from one to two days per turbine. The scheduled maintenance will not require the use of cranes, as it only involves internal inspections and not major equipment changes and personnel can access the equipment from the ladder located inside the tower.

The project will not require fencing, as most of the equipment will be installed within the towers. These will be large tubular structures, secured from unauthorized entry and impossible to scale. The individual transformers adjacent to each turbine will be contained within protective enclosures, also secured and safe for the general public.

4.4.2 Operation Period

The expected period of operation for a typical modern wind turbine is 20 to 30 years. Regular maintenance and equipment upgrades can extend this life span, but it is generally accepted that technological advances will make operating turbines obsolete over such an interval. The first wind projects installed in the late seventies and early eighties are currently reaching this age and have demonstrated that wind turbines can, with some equipment upgrades, continue to operate. Also, a new, upgraded, more productive and more efficient unit can replace an older wind turbine. Thus, at the end of the operating lives of the original turbines, upgrades or replacement are options to be considered instead of decommissioning.

If it is deemed necessary to decommission the project at some time, each wind turbine and associated transformer can be dismantled and removed from the site in a manner similar to that required for installation. The only remaining components would be the service roads, which could remain for recreational access to the area, and the foundations, the bulk of which will be below ground level.

4.4.3 Potential Sources of Pollution and Mitigation During Operation

Wind energy is a clean electricity source. Wind turbines do not produce the greenhouse gases or hydrocarbon emissions associated with fossil fuel power generation. Also, there are no concerns with the disposal of spent radioactive fuel as is the case with nuclear power generation. However, wind turbines do require the use of hydraulic and gearbox oil and the transformers are oil-cooled. These are potential sources of pollution.

Should an oil leak occur from any of the wind turbine components, it would be contained by basins within the nacelle or within the turbine tower. Also, each transformer will be installed on a concrete foundation, with a lip designed to contain any oil spill from it. Frequent site inspections by operations personnel will ensure that any oil leak not already detected by the wind farm control system will be addressed in a timely fashion.

4.4.4 Potential Resource Conflicts During Operation

Recreational land use around the proposed site is expected to be only marginally affected by the presence of the wind turbines. Land uses in the area are limited and no particular resource conflict is expected with the operation of wind turbines.

- Lamanche Provincial Park is located approximately 22 km to the south west of the proposed project area and Butter Pot Provincial Park lies 21 km to the west. No interaction is predicted.
- Gull Island, the northern-most island within the Witless Bay Ecological Reserve, lies 12 km to the south of the proposed site. No interaction is predicted.
- The East Coast Trail runs along the coast line in a north south direction. At its closest proximity, it is over 2 km from the proposed site. From certain points along the Trail, users may see some or all of the erected wind turbines but they will not hear the turbines operating. See section 4.4.5 below for further information.
- The Bay Bulls Big Pond protected watershed area lies 850 m to the west of the project site. Operating wind turbines emit no airborne pollutants or hazardous wastes so no interaction is predicted.
- The head of Queen's River is located approximately 500 m from the site at its closest proximity. The river runs east, away from the site. No interaction is predicted.
- Martins Gully flows through the northern part of the proposed site and the gravel access road will be required to traverse it. A culvert will be installed at a suitably narrow section during the construction period, allowing the road to pass over the gully. It will not be dammed or diverted. Interaction will be limited to the construction period only. No interaction is predicted during operation.
- The nearest residences situated along Route 10 are located at least 1 km away from the site. At this distance, the residents will not hear the turbines operating. No interaction is predicted. See section 4.4.5 below for further information.
- The area is used for hunting of snowshoe hare and grouse and occasional hunting of ptarmigan and moose (Mike McGrath, personal communication). The entire site will be open to these activities. However, subject to safe gun handling practice and provincial firearms or hunting regulations, shooting will be restricted in the vicinity of the wind turbines.
- Berry picking also occurs in the area. The entire site will be open to this activity.

4.4.5 Potential Impacts During Operation

It is understood and appreciated by the project proponent that when any new project is presented to a community, there will be questions and concerns about the potential impacts it may have. Some of these are addressed below.

4.4.5.1 Noise

Noise emissions may be a concern to people living near a wind project. It was an issue with some early wind turbine designs but the problem has diminished as the technology has improved. Early model turbines are generally noisier than most new and larger models. Aerodynamic noise has been reduced by adjusting the thickness of the blades' trailing edges and by positioning the rotor upwind of the turbine tower. As blades have become more efficient, more of the wind energy is converted into rotational torque and less into aerodynamic noise. Also, noise emissions generated by the mechanical components of the turbine have been reduced as a result of improved design and by the use of sound insulation inside the nacelle. Thus, during windy conditions much of the turbine noise is masked by the sound of the wind itself or by the wind passing through trees, etc. Since turbines do not operate without wind they will not emit noise when the wind does not blow and ambient noise is lowest.

Within a wind farm, a normal conversation can be held without raising one's voice. At a distance of 250 meters, a modern wind turbine is no noisier than a kitchen refrigerator. The proposed site will be located at least 1 km away from the nearest residences with a significant forested area existing in between; therefore it is not likely that the wind turbines will even be audible to the local residents.

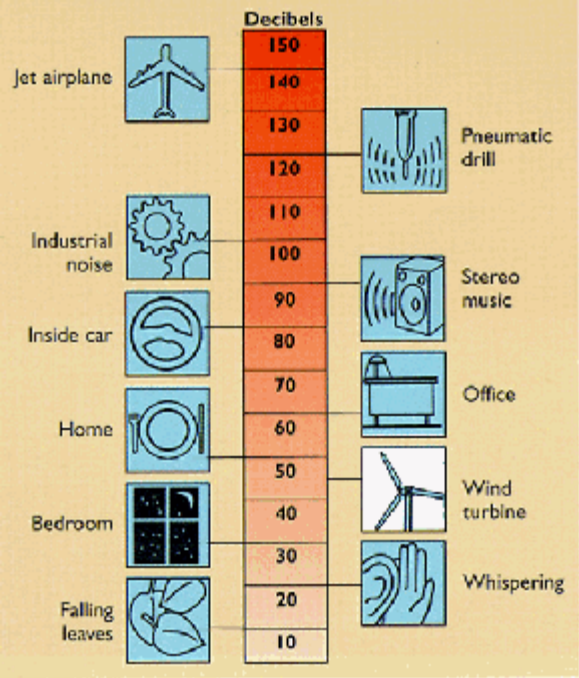

Figure 4.9 Comparison of noise levels (decibels) from a hypothetical wind turbine at a distance of 250 m with other sources of noise. © 2000 American Wind Energy Association.

4.4.5.2 Visual

Wind turbines are viewed by many as an engineering masterpiece, or as a piece of moving sculpture. Of course, beauty is in the eye of the beholder and some citizens will hold an opposite view. Public opinion polls show that the vast majority of people favour wind energy, and support for a proposed wind farm often increases after they are actually installed and operating (American Wind Energy Association).

4.4.5.3 Tourism

There is no evidence that wind farms reduce tourism, but considerable evidence to the contrary. For example, in late 2002, a survey of 300 tourists in the Argyll region of Scotland, noted for its scenic beauty, found that 91% said the presence of new wind farms "would make no difference in whether they would return." Similar surveys of tourists in Vermont, U.S.A. and Australia have produced similar results. Many rural areas in the U.S. have noted increases in tourism after wind farms have been installed, as have scenic areas in Denmark, the world's leader in percentage of national electricity supplied by wind. Other telling indicators: local governments frequently decide to install information stands and signs near wind farms for tourists; wind farms are regularly featured on post cards, magazine covers, and Web pages. (American Wind Energy Association.)

4.4.5.4 Bird Collisions

Although bird mortality is a serious concern for the wind industry, structures such as smokestacks and radio and television towers have been associated with far larger numbers of bird kills than have wind facilities. Other sources of bird mortality, such as Routes and pollution, are responsible for a much higher proportion of total bird deaths. (American Wind Energy Association.)

Worldwide studies have shown that the average wind turbine kills two birds per year - less than the average automobile or house cat (Canadian Wind Energy Association). Radar studies conducted in Denmark, a country surrounded by the sea, determined that birds - by day or night - tend to

change their flight path some 100-200 meters before encountering an operating wind turbine and pass above the turbine at a safe distance.

Thus, wind power's overall impact on birds is low compared with other human-related sources of avian mortality. Furthermore, displacement of fossil fuel power generation by wind power will yield a net benefit to bird populations and the environment as a whole.

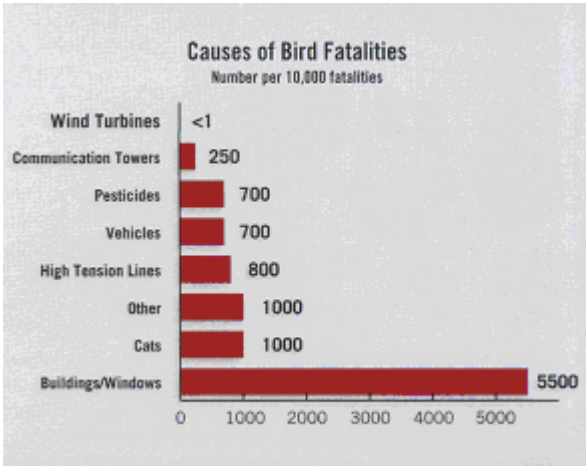

Figure 4.10 Comparison of causes of bird mortality.
Erickson, et.al, 2002. Summary of Anthropogenic Causes of Bird Mortality.

Some species of birds may be attracted to lights. To minimize attraction of birds to operating wind turbines, aircraft warning lights will be installed so that the wind farm conforms to the minimum lighting requirements for tall structures according to Transport Canada regulations. Additional lighting not required will be avoided.

As with other wind power projects which have previously been registered for environmental assessment and subsequently received conditional release from further review, a bird monitoring study specific to the project will be devised and implemented during its operation.

4.5 Occupations

The construction period will require between 10 to 20 people to build access roads, install pole lines and electrical cable, build the foundations and erect the wind turbines.

An assortment of occupational trades will be required for the construction of the project:

Crane Operators	Engineers	Millwrights
Concrete Workers	Heavy Equipment Operators	Utility Line Workers
Control Technicians	Iron Workers	Welders
Electricians	Labourers	

During the operational phase the activities at the site will be limited to scheduled and un-scheduled maintenance. The scheduled maintenance will be performed twice per year and require two service technicians 1 to 2 days per turbine. Un-scheduled maintenance will be in response to unexpected service requirements such as repair or replacement of damaged or failed components.

4.6 Project Related Documents

Anemos Energy Corporation business plan, September 2004.

5 APPROVAL OF THE UNDERTAKING

The following is a list of permits, approvals and authorizations which may be required for the proposed undertaking, with the names of the corresponding issuing authority. This list is not final.

Permit, Approval, Authorization	Issuing Authority
Power Purchase Agreement	Newfoundland Power / Newfoundland and Labrador Hydro
Building Permit and Development Application	City of St. John's
Electrical Permit	City of St. John's
Oversized Loads Permit	City of St. John's
Environmental Permit	Dept. of Environment and Conservation
Application for Crown Lands	Dept. of Environment and Conservation
Application for Grant Pursuant to Lease	Dept. of Environment and Conservation
Application for Environmental Permit for Culvert Installation	Dept. of Environment and Conservation
Tall Structures Obstruction Clearance	Transport Canada

6 SCHEDULE

The start date of construction is contingent on completion of environmental assessment requirements and the wind monitoring study, granting of all necessary permits, negotiation of the power purchase agreement and obtaining necessary financing. It is anticipated that construction will begin between April and October of 2006 to avoid winter conditions and will take 6 to 9 months.

7 FUNDING

Application has been made or will be made to the following funding sources. None have committed any support at the time of writing.

Funding Program	Agency or Department
Environmental Initiatives Grants	City of St. John's
Green Municipal Investment Fund	Federation of Canadian Municipalities in partnership with the City of St. John's
Business Development Program	Atlantic Canada Opportunities Agency
Capital Cost Financing	Business Development Bank of Canada
Small Business and Market Development	Dept. of Innovation, Trade and Rural Development
Canada Small Business Financing Program	Industry Canada

REFERENCES

Ecoregions of Newfoundland, Forest Resources Branch, Department of Natural Resources, Government of Newfoundland & Labrador (http://www.gov.nl.ca/forestry/maps/eco_nf.stm).

Wind Web Tutorial - Wind Energy And The Environment, American Wind Energy Association, 2004 (http://www.awea.org/faq/tutorial/wwt_environment.html#Top).

Wind Energy Fact Sheet - Facts About Wind Energy And Noise, American Wind Energy Association (http://www.awea.org/pubs/factsheets/WE_Noise.pdf).

EBird North American Site Survey, National Audubon Society and Cornell Lab of Ornithology, 2004 (http://www.ebird.org/content/index.html).

PERSONAL COMMUNICATION

Pitcher, Mac, Animal Curator Assistant Manager, Salmonier Nature Park, Department of Environment and Conservation, Government of Newfoundland & Labrador. Contacted October, 2004.

McGrath, Mike, Wildlife Biologist, Inland Fish and Wildlife Division, Department of Environment and Conservation, Government of Newfoundland & Labrador. Contacted October, 2004.