Appendix I. ENVIRONMENTAL PROTECTION PLAN

Mulgrave Community Wind Power Project

Environmental Protection Plan

PREPARED BY

McCallum Environmental Ltd.

November 28, 2013

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Environmental Protection Plan (EPP)

1.0 INTRODUCTION

This Environmental Protection Plan (EPP) has been prepared to guide the design and installation of the physical components of the Mulgrave Community Wind Power project.

The purpose of the EPP is to establish procedures and methods to be used in the construction and operation of the Mulgrave Community Wind Power project that reduce impacts on the environment. The EPP applies provincial and, where appropriate, federal regulations & guidelines for construction activities and procedures.

The EPP includes an Emergency Response Plan (ERP) to address environmental emergencies, an Environmental Management Plan which lays out the procedures to be followed during the conduct of the work and a Site Restoration Plan (SRP). This ERP will be harmonized with the contractor's ERP and will be made available to all site personnel.

The EPP incorporates approved design methods for erosion and sediment control, defines setbacks from streams and wetlands and areas of environmental or heritage significance. It provides guidance for appropriate engineering designs for surface water management and stream crossings. The EPP also designates the timeframes for seasonally sensitive activities and establishes prohibitions for the project design and construction activities.

This document may be amended from time to time. Amendments will be issued by the Proponent Celtic Current LP and the project manager will ensure that all copies will receive amendments.

2.0 EMERGENCY RESPONSE

The following provides contact numbers in the case of emergencies involving: worker safety, public safety, and emergency response to address environmental emergencies.

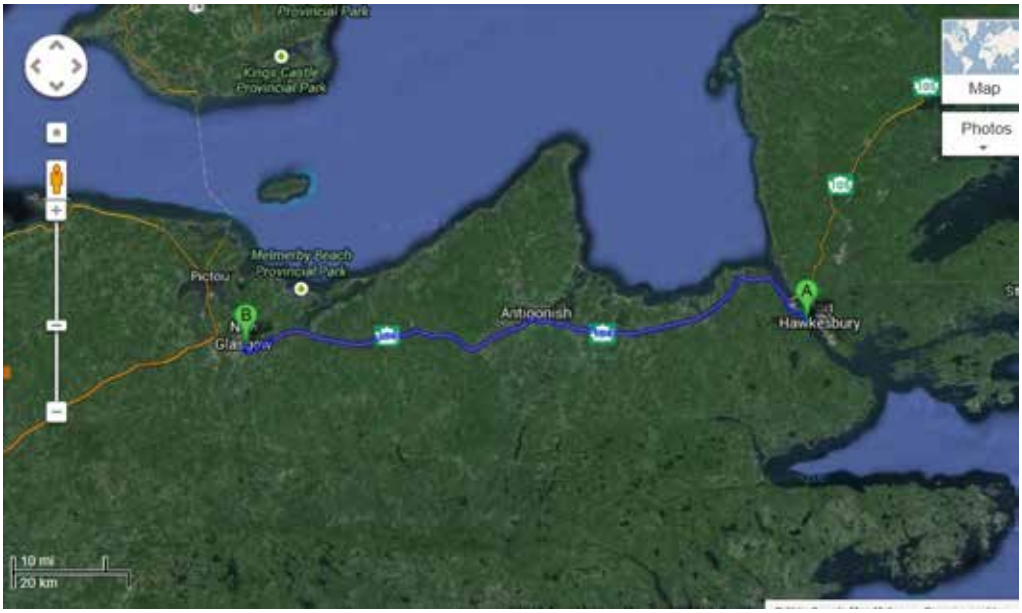
2.1 Emergency Contact List

Organization	Contact Name	Contact Number
Fire Department	-	**911**
Ambulance	-	**911**
RCMP Police	-	**911**
Hospital	Aberdeen Regional Hospital, 835 East River Road, New Glasgow	**(902) 752-8311**
Poison Control	-	**1-800-565-8161**
Chief Financial Officer, Celtic Current LP	Martha Campbell	**1-902-945-2300**
Project Manager Celtic Current LP	Peter Archibald	**1-902-945-2300**
Health and Safety Officer, Celtic Current LP	TBA	
Nova Scotia Department of Environment	Emergency Measures Office	**1-800-565-1633**
Nova Scotia Environment Port Hawkesbury	David Fougere	**(902) 625-0791**
Nova Scotia Department of Labour	Health and Safety - 24 hour Response	**1 -800-952-2687**
NS Department of Natural Resources, Antigonish County	Mark Pulsifer	**(902) 863-7523**
Environment Canada	Environmental Protection Emergency Response	**1-800-426-6200**
Environmental Advisor Celtic Current LP	Meghan Milloy	**(902) 880-6375**
Archaeological Artifacts, Special Places Coordinator	Laura Bennett	**(902) 424-6475**

2.2 Key Personnel Contact List

Position	Name	Phone Number	Fax Number	Cell Phone Number
Chief Executive Officer, Celtic Current LP	Leonard van Zutphen	(902)	(902)	(902)
Chief Financial Officer, Celtic Current LP.	Martha Campbell	(902)	(902)	(902)
Project Manager	Peter Archibald	(902)	(902)	(902)
Field Inspector, Celtic Current LP	Meghan Milloy	(902) 446-8252	-	(902) 880-6375
Health and Safety Officer	TBA			
Senior Environmental Advisor	Robert McCallum	902-446-8252		(902) 292-0514
Legal Counsel	TBA			
NS Environment, Port Hawkesbury	Dave Fougere	(902) 625-0791	(902) 625-3722	-
DNR, Antigonish County	Mark Pulsifer	(902) 863-7523	(902) 863-7342	-
DNR, Pictou County	Kim George	(902) 893-6353	(902) 893-5613	
Fisheries and Oceans, (DFO)	Charles McInnis	(902) 863-5670		
NS Tourism, Culture and Heritage	Laura Bennett	(902) 424-6475	(902) 424-0560	-
Maritime Aboriginal Peoples Council	Roger Hunka	(902) 895-2982	-	-
Union of Nova Scotia Indians	Nancy Paul	(902) 538-4107	-	-
Mi'kmaq Rights Initiative	Eric Christmas	(902) 843-3880	-	-

2.3 Guide Map to Regional Hospital



Mulgrave, NS
Canada

1. Head **northwest** on **Middle St** toward **Dale Ave**
30 m

2. Take the 1st right onto **Dale Ave**
110 m

3. Turn left onto **NS-344 N**
6.1 km

4. Turn left onto **NS-104 W/NS-4 W/Trans-Canada Hwy** (signs for **Trans Canada Highway/Antigonish**)
Continue to follow NS-104 W/Trans-Canada Hwy
104 km

5. Take exit **25** for **NS-348 N/East River Road** toward **New Glasgow/Trenton**
300 m

6. Merge onto **E River Rd/NS-348 N**
750 m

7. Turn left
Destination will be on the left
88 m

Aberdeen Hospital
835 E River Rd
New Glasgow, NS B2H 3S6, Canada

3.0 ENVIRONMENTAL MANAGEMENT PLAN GENERAL PROVISIONS

The Environmental Management Plan (EMP) has been developed to guide site specific construction activities and procedures. The purpose of the EMP is:

1. to manage and minimize risks and potential environmental impacts from construction activities;
2. To ensure that Celtic Current's commitments to minimizing environmental effects are met;
3. To ensure development activities meet all provincial, federal and municipal requirements;
4. To provide mitigation of the potential environmental impacts due to construction activities; and,
5. To provide a reference document for planning and/or conducting construction activities that may have an impact on the environment.

This EMP was developed by Celtic Current to describe the protection measures to be followed by Celtic Current personnel and all contractors required for activities associated with development of the Mulgrave Community Wind Power Project. Celtic Current's appointed project manager will be responsible for the enforcement of these procedures.

3.1 Construction Environmental Mitigation Measures

A. Design Specifications

1) Construction specifications will be completed to turbine manufacturer's technical specifications for:
    1) Access Roads and Crane Platforms
    2) Civil works, Crane and Road Requirements
    3) Other engineering design specifications pertaining to the Mulgrave Community Wind Project as specified by Celtic Current and their project engineers;

    If a conflict arises between technical specifications and regulatory requirements, regulatory requirements shall prevail, unless amendments are approved by the appropriate regulatory body.

B. Work Areas

1) All construction activities will be restricted, as much as practically possible, to approved work spaces, designated access roads and turbine sites;

2) During tower foundation construction, the crane platform areas may also serve as storage areas for material (e.g. reinforced steel) and machinery.

C. Runoff Control and Prevention of Sedimentation

1) When possible, the contractor will avoid grading immediately before or after heavy rain events, which would further loosen the road surface and promote runoff of graded material;

2) Aggregate which is to be used in or near watercourses will be washed quarried material;

3) For construction activities near watercourses, erosion and sediment control measures will be used to minimize erosion and ensure silt containment. The contractor will be responsible for maintaining these erosion and sedimentation control systems to ensure their effectiveness. These measures are outlined in Section 4.4;

4) All silt fences will maintain a minimum setback distance from water courses and wetlands of 10m;

5) Any water which intrudes into excavations that will be removed by pumping will not be discharged directly into any wetland or watercourse. If discharge water from pumping operations contains Total Suspended Solids (TSS) which exceeds 25 mg/l above the background condition of the watercourse at the site, discharge water from excavation will be pumped to a designated area up-gradient and downstream of the excavation. The discharge may be either be allowed to spill onto the ground and return to the watercourse following the natural topography, providing that the discharge is greater than 100 metres from a natural drainage course. Sedimentation bags, or containers with washed gravel will be used to dissipate flow and reduce erosion;

6) Following completion of construction and once vegetation has established, non bio-degradable erosion and sediment barriers will be removed from those areas which may be flooded by watercourses under high flow seasonal conditions to prevent these materials from being entrained in the watercourses;

7) If bridge footing excavations intrude into a watercourse for any reason, the contractor will be responsible to obtain prior environmental approvals and permitting for the watercourse alterations, diversions or temporary barriers as necessary to complete the installation;

8) Material placed in or adjacent to the watercourses for the temporary diversion will be removed as soon as possible by the contractor after the construction of work is completed;

9) Celtic Current will conduct visual assessments, both quarterly and after severe storm events, of the site to ensure the effectiveness of erosion and sedimentation control measures, unless otherwise approved by NSE.

10) Celtic Current and the Contractor will follow the *Nova Scotia Erosion and Sediment Control Manual* and/or follow the erosion and sediment control plan as outlined in this document (Section 4.4);

11) Any loss of containment or release of sediments will be reported immediately to the project manager and to NSE.

D. Bedrock Removal and Blasting

1) Where possible, rock excavation will be performed by ripping rather than blasting. Should blasting be required, no blasting will occur unless otherwise approved by NSE;

E. Pits

1) All aggregate sources will be approved by the project engineer and based on considerations such as the Pit and Quarry Guidelines (NSDOE May 4, 1999);
2) The Contractor will be responsible for obtaining NSE approvals for Pits greater than 2 hectares in size. Quarries of any size require NSE approval;
3) The slopes of all excavation pits will be constructed to a 3:1 slope;
4) If a pit is inconspicuous and poses a perceived safety hazard, the area will be marked with signs and/or fencing, depending on its location;
5) Pits may be backfilled with native material, and seeded with non-invasive, native, herbaceous plant species. Alternatively, pits may sloped to 3:1, stabilized, erosion controlled, and reclaimed to allow water to naturally collect within the pits to provide wetland habitat. In compliance with Section 6 of the Migratory Bird Regulations (MBR), this activity may not be conducted during the breeding season if birds which may use embankments for nesting sites are identified in the pit(s), typically between May 1st and August 31st for most species;
6) If adequate borrow pits and/or disposal sites are not available within the project area, offsite sources of fill will be used.

F. Vehicle and Equipment Operation and Fueling

1) All personnel, vehicles, equipment, etc…will follow all applicable traffic regulations and posted site speed limits and traffic controls;
2) Appropriate dust suppression measures will be used as required. Water will be used for dust suppression. The use of any other substance for dust is to be avoided;
3) Storage of petroleum, oil and lubricants (POL) on site during the construction phase will be in designated areas and will be done in compliance with applicable provincial and federal regulations, codes and guidelines;
4) The contractor will maintain an onsite emergency spill containment kit to adequately control any loss of fuel or lubricant by equipment;
5) Waste petroleum products, oils and lubricants (POL) will be properly contained and not released into the environment. Waste POL and all spent containers will be

contained and removed from the site for proper disposal at an approved disposal facility;

6) Vehicles will be fueled at designated sites away from wetlands and watercourses (minimum distance 50 m);
7) The transportation of dangerous goods will be conducted in compliance with the Transportation of Dangerous Goods Act;
8) The construction site will have restricted access signage to prevent trespassing or inadvertent entrance by public vehicles. ''Restricted Access'' signs will be posted at the entrance of primary access roads which leave private property and enter onto public right-of-ways;
9) Equipment and vehicles will yield the right-of-way to wildlife;

G. Construction Waste

1) Construction waste will be removed from the project area and disposed of at an approved location or facility;
2) Disposal of waste materials from construction activity will be in accordance with NSDTC's Standard Specifications (1980 and revisions) for Access Road Construction;
3) Unless otherwise directed by the project manager, limbs and timber will be chipped at the site, in accordance with the Nova Scotia Forest Fire Protection Act. Non-combustible material, overburden and rock will be disposed of where their use as fill material is impractical;
4) Waste disposal areas will be located where they do not negatively impact rivers, wetlands or any watercourse;
5) Portable toilets will be used at the construction site so that no untreated sewage is disposed of in the watercourses or on site.

H. Species of Concern, Rare and Endangered Species, and Historic Artifacts

1) A buffer area of 30 m will be established around rare plants using surveying ribbon and signs to prevent unauthorized intrusion;
2) Should excavation uncover historic artifacts, work at the excavation site will cease and the project engineer will be contacted immediately. The project manager will contact the appropriate authorities from the Department of Tourism, Culture and Heritage and First Nations. Work on site will re-commence work following regulatory clearance.

I. Surface Water, Wetlands, Watercourses

1) No construction will occur within 30 metres of a wetland or watercourse unless otherwise authorized by Nova Scotia Environment (NSE);
2) Culverts will be installed as per the requirements of NSE;
3) The design of all water crossings and culverts will be approved by an individual who has successfully completed Nova Scotia Watercourse Alteration training;
4) Disposal of any agent, either directly or indirectly, will not be permitted into any watercourse or wetland;
5) Prior to construction, watercourses will be inspected at locations upstream, adjacent to, and downstream of the site. The conditions of these areas will be photographed as background information on the riparian zone and stream features at each water crossing.

J. Wildlife Encounters

1) Garbage disposal will occur at designated disposal locations throughout the project for removal;
2) Harassment of any wildlife by site personnel will not be permitted;
3) Wildlife sightings will be reported to the project engineer or designate;
4) Any disruption or injury to wildlife will be reported to the local Provincial Wildlife Officer;
5) In the event of encounters with injured wildlife at the worksite, the project engineer or designate will contact the local Provincial Wildlife Officer. No attempt will be made to move the animal and no person at the worksite will come into direct contact with the animal;
6) Dead animals will be reported, as soon as possible, to the project engineer or designate who will notify the local Provincial Wildlife Officer. The locations of animals will be marked and reported to the project engineer or designate. The project engineer or designate will record the date and time it was found; state of decomposition; injury sustained (if identifiable); and species. This information will be kept on file with Celtic Current for incorporation into the post-construction monitoring program;

K. Fires / Medical Emergencies

1) All site personnel will be responsible for fire prevention and will conduct their work in a safe manner to prevent fires;
2) Flammable waste will not be disposed of on site but will be removed for disposal in an appropriate manner;

3) Smoking will be prohibited within 50 m of flammable products;
4) Some personnel will have taken the training course for dealing with energy industry fires but not for wildland fires. In the event of a wildfire, the workers will follow the Contractor Emergency Response Plan;
5) In the event of a fire on or near the turbine site, onsite personnel will attempt to put out the fire if it is safe to do so, using the onsite firefighting equipment. The fire will be reported immediately to the project engineer or designate. If the fire cannot be contained, the nearest fire department (Barney's River Volunteer Fire Department) will be contacted at 9-1-1.
6) In case of medical emergencies, the Contractor Emergency Response Plan will be adhered to;
7) Celtic Current will provide members of the nearest fire departments and medical rescue personnel with project plans and access road layouts for the project area. GPS coordinates for the road alignments and turbine locations will be provided to emergency responders for their reference;

4.0 ENVIRONMENTAL PROTECTION PLAN

The following are general guidelines that promote environmental protection:

- Plan operations from "cradle to grave";
- Report unsafe acts and/or acts that could result in harm to the environment;
- Address the issues if they are known, do not turn a blind eye;
- Conserve soil;
- Protect water resources;
- Control emissions;
- Prepare emergency response plans;
- Manage waste;
- Do not litter;
- Conduct HSE inspections;
- Regulatory inspections may be conducted at any time and participation and cooperation is required;
- If an incident occurs follow proper procedures;
- Practice good housekeeping at all times;
- Report HSE issues internally and externally as required;
- Maintain records as required;

4.1 Access Road Construction

4.1.1 Clearing and Grubbing

- Any merchantable timber present on the road alignment will be cut, decked and removed for sale or reuse;
- Only the areas required for the road alignment, construction work areas and laydown areas will be cleared and grubbed;

- Burning of cleared and grubbed material is not permitted. Excess brush and cleared materials will be chipped and the chips distributed over the site unless otherwise directed.
- In consultation with the environmental advisor brush piles may be created around cleared areas as wildlife habitat. The locations and size of such brush pile will be determined by the requirements of individual sites and the discretion of the environmental advisor;

4.1.2 Road Specifications

- The specifications for the road characteristics will be provided by the wind turbine provider and the contractor providing the heavy lift crane. However, road side slopes will be designed to achieve a maximum 2:1 slope (horizontal:vertical). Figure 4.2: Typical Access Road Cross Section and Ditch Detail shows the specifications to be followed for the access roads;
- Prior to construction, the final road specifications will be reviewed by the project manager, project engineer (civil) and environmental advisor for compliance with applicable provincial standards and environmental guidelines who will advise the Turbine provider and the contractor on any required amendments.

4.1.3 Construction Methods

- The access road will be logged and all timber skidded to appropriate log decks;
- All stumps will be stripped by bulldozer and piled along the boundary of the cleared right-of-way;
- Surface soils will be stripped to both sides of the access road;
- Subsoils will be stripped to the underlying parent material layer and piled on both sides of the access road, adjacent to surface soil piles;
- Subsoils will be stripped from the ditchline and placed in the middle of the road to build up the road traveling surface;
- During road construction, a trench will be dug with a backhoe, running parallel to the road. The ditch will be filled with stripped non-salvageable materials, and ultimately filled in;
- Previously piled subsoils will be feathered back into the ditchline;
- Previously piled topsoils will be feathered back into the ditchline over the subsoils;
- Where steep hills, small hills or knolls are encountered, the tops of the hills will be cut and pushed down the road to reduce the slopes required for travel;

4.2 Water Crossings

For the sizing of the culverts and bridges, *the Design Flow Formula Map for Nova Scotia for 1:100 Year Storm Event (Permanent Structures)* [updated in 2008] will be consulted.

The drainage area will be delineated using a combination of applied methods (Watercourse Alteration Guidelines) and computer programming. Basically, the area will be mapped with both the 5m contour data as well as recent aerial photographs. The zones of delineation were set out making sure to cross the contour lines at 90 degrees. Instead of overlaying a dot grid and counting, the GIS program is able to give precise calculated area measurements in hectares.

4.3 TURBINE SITE

The preparation and construction of the turbine site will follow the applicable requirements of Section 3.1 *a* through *m*. In addition, the following requirements will apply.

4.3.1 Clearing and Grubbing

- Any merchantable timber present on the turbine site will be cut, decked and removed for sale or reuse.
- Only the areas required for the turbine layout, construction pad and crane will be cleared and grubbed;
- Burning of cleared and grubbed material is not permitted. Excess brush and cleared materials will be chipped and the chips distributed over the site unless otherwise directed;
- In consultation with the environmental advisor, brush piles may be created around cleared areas as wildlife habitat. The locations and size of such brush piles will be determined by the requirements of individual sites on the advice and discretion of NSDNR and the wildlife advisor;
- Two lift stripping of soils may occur if subsoils are suitable to do so;
- Surface soils will be stripped and pushed to the boundary of the cleared site;
- A second stripping of subsoils may occur if possible, and will be pushed to the boundary of the turbine sites;
- Subsoils will be leveled to provide a suitable working surface;

4.4 Project Erosion & Sediment Control Options

Celtic Current would like to emphasize that it recognizes that successful erosion / sedimentation control requires correct installation of controls specific to site conditions, while also recognizing that ongoing maintenance is essential for successful outcome.

The planning strategies and structural components presented in this document are as equally important as the conceptual understanding of the principles of their implementation to ensure good construction performance and protection of the environment.

As such Celtic Current is providing what it perceives to be Best Management Practices for the project. Within the project, at the field level, any of these practices may be installed. Each area within the project will require specific control plans to be developed on-site using the principles and guidelines presented in conjunction with the lead Contractor (TBD).

The difference between erosion and sediment control methods is defined and summarized for the purposes of this document and all related activities on at construction projects as follows:

- Erosion Control is the process whereby the potential for erosion is minimized and is the primary means in preventing the degradation of downstream aquatic resources;
- Sedimentation Control is the process whereby the potential for eroded soil being transported and/or deposited beyond the limits of the construction site is minimized and is, for all intents and purposes, a contingency plan.

Both erosion and sedimentation control measures are dynamic and need to respond to requirements encountered throughout construction. Therefore, both temporary and permanent erosion and sedimentation control measures should be expected to evolve throughout construction to varying degrees based on site conditions and field performance of implemented measures.

Celtic Current will install erosion controls immediately after a disturbance resulting from a project in an erosion prone area. Erosion controls will be properly maintained, reinstalled as necessary and/or replaced until restoration is complete.

Erosion and sedimentation control measures required can be classified into two categories:

1. Temporary Measures: Those measures during the construction phase that may be completely removed to facilitate further construction that has other erosion control measures associated with it; and
2. Permanent Measures: Incorporated into the overall design of the development to address long-term post construction erosion and sedimentation control.

Temporary erosion and sedimentation control measures will be constructed at the start of the construction phase. However, additional measures will likely need to be constructed throughout construction. Permanent erosion and sedimentation control measures can be constructed during or at the end of the construction phase.

Examples of temporary measures include:

- Seeding;
- Slope texturing;
- Synthetic permeable barrier,
- Mulching;
- Hydroseeding;
- Biodegradable coverings;
- Filter fence;
- Fibre rolls and wattles;

Examples of permanent measures include:

- Offtake ditches;
- Energy dissipater;
- Earth dyke
- Gabion;
- Rock check;
- Sediment pond/basin;

Dependent on site conditions, some temporary measures will be retained for a longer duration to render its life span more permanent. With both temporary and permanent measures, the functional longevity of the method to be used will be taken into account prior to implementation.

This is not limited to the duration of the project, but to return to pre-disturbance conditions. The Construction Consultant/Environmental Monitor will consult with construction personnel on the appropriate measures to be taken. The measures outlined in the following tables discuss various erosion and sedimentation control locations of ideal use, advantages and limitations.

Table 1. Methods for Protection of Exposed Surfaces

Method	Slopes	Ditches & Channels	Large Flat Surface Areas	Borrow & Stockpile Areas	Advantages	Limitations
Topsoiling	X	X	X	X	Placing topsoil provides excellent medium for vegetation root structure to develop in; organic content promotes plant growth, reuse organics (topsoil or peat) stripped from the site at start of grading; absorb raindrop energy to minimize erosion potential	Cannot be effective without seeding and allowing time for plant growth; not appropriate for slopes steeper than 2H:1V (steep slopes will require soil covering over topsoil and specialized design); dry topsoil susceptible to wind erosion, susceptible to erosion prior to establishment of vegetation
Seeding	X	X	X	X	Inexpensive and relatively effective erosion control measure, effectiveness increases with time as vegetation develops, aesthetically pleasing, enhances terrestrial and aquatic habitat	Must be applied over prepared surface (topsoiled), grasses may require periodic maintenance (mowing), uncut dry grass may be a fire hazard, seeding for steep slopes may be difficult, seasonal limitations on seeding effectiveness may not coincide with construction schedule, freshly seeded areas are susceptible to runoff erosion until vegetation is established, reseeding may be required for areas of low growth
Mulching	X	X	X	X	Used alone to protect exposed areas for short periods, protects soil from rainsplash erosion, preserves soil moisture and protects germinating seed from temperature extremes, relatively inexpensive measure of promoting plant growth and slope protection	Application of mulch on steep slopes may be difficult, may require additional specialized equipment not commonly used.
Hydroseeding-Hydromulching	X	X	X	X	Economical and effective on large areas, mulch tackifier may be used to provide immediate protection until seed germination and vegetation is established, allows re-vegetation of steep slopes where conventional seeding/mulching techniques are very difficult, relatively efficient operation, also provides dust and wind erosion control	Site must be accessible to Hydroseeding Hydromulching equipment (usually mounted on trucks with a maximum hose range of approximately 150 m), may require subsequent application in areas of low growth as part of maintenance program

Riprap Armoring	X	X			Most applicable as channel lining with geotextile underlay, used for soils where vegetation not easily established, effective for high velocities or concentrations, permits infiltration, dissipates energy of flow from culvert inlets/outlets, easy to install and repair, very durable and virtually maintenance free, flexible lining for ditches with ice build-up	Expensive, may require heavy equipment to transport rock to site and place rock, may not be feasible in areas of the province where appropriate rock is not readily available, may be labour intensive to install (hand installation); generally thickness of riprap is higher when compared to gabion mattress
Gravel Blankets	X	X			Stabilizes soil surface with rock lining thus minimizing erosion, permits construction traffic in adverse weather, may be used as part of permanent base construction of paved areas, easily constructed and implemented, can be used to stabilize seepage piping erosion of slope	Must be designed by qualified geotechnical personnel, expensive, may not be feasible in areas of the province where gravel is not readily available, areas of high groundwater seepage may require placement of non-woven geotextile underlay and additional drainage measures
Biodegradable Erosion Control Products	X	X			Provides a protective covering to bare soil or topsoiled surface where degree of erosion protection is high, can be more uniform and longer lasting than mulch, wide range of commercially available products	Use must be based on design need of site, certification of physical properties and performance criteria (tractive resistance) is required, labour intensive to install, temporary blankets may require removal prior to restarting construction activities, not suitable for rocky slopes, proper site preparation is required to seat onto soil correctly; high performance is tied to successful vegetation growth
Cellular Confinement System	X	X		X	Lightweight cellular system and easily installed, uses locally available soils or grout for fill to reduce costs	Not readily used in construction, expensive, installation is labour intensive (hand installation), not suitable for slopes steeper than 1H:1V
Planting Trees and Shrubs	X		X	X	Establishes vegetative cover and root mat, reduces flow velocities on vegetative surface, traps sediment laden runoff, aesthetically pleasing once established, grows stronger with time as root structure develops, usually has deeper root structure than grass	Expensive, revegetated areas are subject to erosion until plants are established, plants may be damaged by wildlife, watering is usually required until plants are established

Riparian Zone Preservation	X	X	X	X	Preserve a native vegetation buffer to filter and slow runoff before entering sensitive (high risk) areas, most effective natural sediment control measure, slows runoff velocity, filters sediment from runoff, reduces volume of runoff on slopes	Stipulate construction activities with careful planning to include preservation areas, freshly planted vegetation for newly created riparian zones requires substantial periods of time before they are as effective as established vegetation at controlling sediment
Slope Texturing	X			X	Roughens slope surface to reduce erosion potential and sediment yield; suitable for clayey soils	Additional cost; not suitable for silty and sandy soils; not practical for slope length <8 m for dozer operation up/down slope

Table 2. Methods for Runoff Control

Method	Slopes	Ditches & Channels	Large Flat Surface Areas	Borrow & Stockpile Areas	Advantages	Limitations
Slope Texturing	X		X	X	Contouring and roughening (tracking) of slope face reduces runoff velocity and increases infiltration rates; collects sediment; holds water, seed and mulch better than smooth surfaces; promotes development of vegetation, provides loss of soil reduction in soil erosion compared with untracked slopes	May increase grading costs, may cause sloughing in sensitive (wet) soils, tracking may compact soil, provides limited sediment and erosion control and should not be used as primary control measure
Offtake Ditch	X		X	X	Collects and diverts sheet flow or runoff water at the top of a slope to reduce down slope erosion potential, incorporated with permanent project drainage systems	Channel must be sized appropriately to accommodate anticipated flow volumes and velocities, lining may be required, may require design by qualified personnel, must be graded to maintain positive drainage to outlets to minimize ponding
Energy Dissipater	X	X			Rip rap or sandbags slow runoff velocity and dissipate flow energy to non-erosive level in relatively short distances, permits sediment collection from runoff	Small diameter rocks/stones can be dislodged; grouted rip-rap armouring may breakup due to hydrostatic pressures, frost heaves, or settlement; may be expensive, may be labour intensive to install; may require design by qualified personnel for

						extreme flow volumes and velocities
Gabions		X			Relatively maintenance free, permanent drop structure, long lasting (robust), less expensive and thickness than rip-rap, allows smaller diameter rock/stones to be used, relatively flexible, suitable for resisting high flow velocity	Construction may be labour intensive (hand installation), extra costs associated with gabion basket materials, synthetic liner required underneath to prevent undercutting
Log Check Dam		X			Equally effective as silt fences for sediment trapping and straw bale barriers as drop structure, may include timber salvaged from site during clearing operations, most applicable at clearing/grubbing stages of construction	May be expensive, not commonly used after stripping stage, not appropriate for channels draining areas larger than 4 ha (10 acres), labour intensive to construct, gaps between logs may allow sediment laden runoff to escape, logs/timbers will rot over time (not permanent)
Synthetic Permeable Barriers		X			Reusable/moveable, reduces flow velocities and dissipate flow energy; retains some sediments; used as grade breaks in grades	Not to be used as check structures, must be installed by hand in conjunction with Biodegradable components, become brittle in winter and are easily damaged by construction. Only partially effective in retaining some sediment, primarily used for reducing flow velocities and energy dissipation
Fibre Rolls and Wattles	X				Function well in freeze-thaw conditions, low cost solution to sheet flow and rill erosion on slopes, low to medium cost flow retarder and silt trap, can be used on slopes too steep for silt fences or straw bale barriers, biodegradable	Labour intensive to install (hand installation), designed for slope surfaces with low flow velocities, designed for short slope lengths with a maximum slope of 2:1

Table 3. Methods for Sediment Control

Method	Slopes	Ditches & Channels	Large Flat Surface Areas	Borrow & Stockpile Areas	Advantages	Limitations
Riparian Zone Preservation	X	X	X	X	Preserve a native vegetation buffer to filter and slow runoff before entering sensitive (high risk) areas, most effective natural sediment control measure, slows runoff velocity, filters sediment from runoff, reduces volume of runoff on slopes	Stipulate construction activities with careful planning to include preservation areas, freshly planted vegetation for newly created riparian zones requires substantial periods of time before they are as effective as established vegetation at controlling sediment
Brush or Rock Filter Berm	X	X	X	X	More effective than silt fences, uses timber and materials salvaged from site during clearing and grubbing, can be wrapped and anchored with geotextile fabric envelope	More expensive than silt fences, temporary measure only, not effective for diverting runoff, expensive to remove, not to be used in channels or ditches with high flows
Fibre Rolls and Wattles	X				Function well in freeze-thaw conditions, low cost solution to sheet flow and rill erosion on slopes, low to medium cost flow retarder and silt trap, can be used on slopes too steep for silt fences or straw bale barriers, biodegradable	Labour intensive to install (hand installation), designed for slope surfaces with low flow velocities, designed for short slope lengths with a maximum slope of 2:1
Pumped Silt Control Systems (Silt Bag)		X			Filter bag is lightweight and portable, simple set up and disposal, sediment-laden water is pumped into and contained within filter bag for disposal, different aperture opening sizes (AOS) available from several manufacturers; for emergency use only under overflow conditions	May be expensive, requires special design needs, requires a pump and power source for pump, suitable for only short periods of time and small volumes of sediment laden water, can only remove particles larger than aperture opening size (AOS)

Silt Fence	X		X	X	Economical, most commonly used sediment control measure, filters sediment from runoff and allows water to pond and settle out coarse grained sediment, more effective than straw bale barriers	May fail under high runoff events, applicable for sheet flow erosion only, limited to locations where adequate space is available to pond collected runoff, sediment build up needs to be removed on a regular basis, damage to filter fence may occur during sediment removal, usable life of approximately one year
Earth Dyke/Barrier			X	X	Easy to construct, relatively inexpensive as local soil and material is used; can be easily converted to Sediment Pond/Basin	Geotechnical design required for fill heights in excess of 3 m, may not be suitable for all soil types or sites; riprap spillway and/or permeable outlet may be required
Gabions		X			Relatively maintenance free, permanent drop structure, long lasting (robust), less expensive and thickness than rip-rap, allows smaller diameter rock/stones to be used, relatively flexible, suitable for resisting high flow velocity	Construction may be labour intensive (hand installation), extra costs associated with gabion basket materials, synthetic liner required underneath to prevent undercutting
Rock Check Dam		X		X	Permanent drop structure with some filtering capability, cheaper than gabion and armouring entire channel, easily constructed	Can be expensive in areas of limited rock source, not appropriate for channels draining areas larger than 10 ha (4 acres), requires extensive maintenance after high flow storm events, susceptible to failure if water undermines or outflanks structure
Log Check Dam		X			Equally effective as silt fences for sediment trapping and straw bale barriers as drop structure, may include timber salvaged from site during clearing operations, most applicable at clearing/grubbing stages of construction	May be expensive, not commonly used after stripping stage, not appropriate for channels draining areas larger than 4 ha (10 acres), labour intensive to construct, gaps between logs may allow sediment laden runoff to escape, logs/timbers will rot over time (not permanent)
Synthetic Permeable Barriers		X			Reusable/moveable, reduces flow velocities and dissipate flow energy; retains some sediments; used as grade breaks in grades	Not to be used as check structures, must be installed by hand in conjunction with Biodegradable components, become brittle in winter and are easily damaged by construction. Only partially effective in retaining some sediment, primarily used for reducing flow velocities and energy

						dissipation

Table 4. Control Methods and Appropriate Construction Activity.

METHOD	Clearing & Grubbing	Stripping	Borrow Sources	Sub Excavation	Stockpiles	Cut Slope	Fill Slope	Ditches / Channels	Culverts	Temporary Haul Roads
Silt Fence	X	X	X		X	X	X		X*	X
Gabions								X	X	
Brush or Rock Filter Berm	X	X	X		X	X	X			
Continuous Berm	X	X	X		X	X	X			X
Earth Dyke Barrier	X	X	X		X	X	X			X
Inlet Protection								X	X	
Rock Check Structure								X		
Log Check Structure								X		
Synthetic Permeable Barrier								X		
Straw Bale Check								X		
Straw Bale Barrier			X		X	X	X			X
Biodegradable Erosion Products					X	X	X	X		
Rip Rap Armouring								X	X	
Cellular Confinement System						X	X	X		
Gravel Blankets						X	X	X		
Energy Dissipaters								X	X	
Sediment Ponds and Basins		X						X		
Slope Drains						X	X			
Offtake Ditches		X	X	X		X	X			
Seeding			X		X	X	X	X		
Mulching			X		X	X	X	X		
Hydroseeding			X		X	X	X	X		
Topsoiling			X		X	X	X	X		
Planting Trees and Shrubs						X	X	X		
Fibre Rolls			X		X	X	X			
Riparian Zone Preservation	X	X	X	X	X	X	X	X		X
Pumped Silt Control Systems								X	X	
Slope Texturing			X	X	X	X	X			X

Notes:
* Suitable for spilling basin at culvert inlet

Personnel associated with this project will adhere to the following generic guidelines:

- Maintain existing vegetation cover whenever possible and minimize the area of disturbance by minimizing travel. Maintaining existing vegetation cover is the best and most cost-effective erosion control practice;
- Retain and protect vegetation layer to reduce erosion potential;
- All vehicular traffic must stay within designated accesses. All suspected off RoW travel must be reported immediately to the Environmental Monitor/Construction Consultant;
- Install all erosion and sediment control practices prior to any soil disturbing activities, when applicable;
- Avoid frequent or unnecessary travel over erosion prone areas;
- Install silt fence on the down-slope perimeter of all steep (3:1 or greater slope) disturbed areas according to the attached installation instructions;
- Add mulch, straw crimping or silage along with native vegetation seed to all disturbed areas as required;
- Upon final abandonment, areas that have erosion potential may be straw crimped and or matted and seeded to return the area to pre-disturbance conditions in a timely fashion.

Inspection & Maintenance

Continued inspection and maintenance of erosion and sedimentation control measures may be required after completion of construction. Regular inspections should be conducted on a weekly basis or as required with respect to storm events and snow melt.

The contractor will be responsible for maintenance of the erosion control works installed under this EPP during construction. During operations, Celtic Current will be responsible for maintenance.

Inspection and maintenance will continue until the erosion control is no longer required. The following circumstances and conditions will determine this outcome:

a. Revegetation of bare soil was successful;
b. No obvious erosion scour is observed;
c. No obvious bedload of silt and sediment laden runoff is observed;
d. Inspection and maintenance report indicates satisfactory performance;

All maintenance preformed on erosion and sediment control measures will be recorded.

4.5 Vegetation Management Program

Celtic Current recognizes that each operational region is unique and that weed management that is effective in one area, may not be effective in another. However, Celtic Current's policy to

control vegetation will be based upon the species identified during discussions with landowners, regulators and field assessments.

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Celtic Current will take the following approach to vegetation management:

- Prevention
- Chain of Custody
- Procedures for Vegetation Control
- Monitoring
- Identification

4.5.1 Prevention

- Prevention is paramount to an effective weed management program;

- Celtic Current will attempt to minimize the potential for weed introduction/invasion by seeding all disturbed areas with landowner approved seed mixes.

4.5.2 Seeding

- Use a certified native seed mix. Purchase only certified seed from a recognized member of the Canadian Seed Growers Association (CSGA). Obtain a certificate of analysis that identifies weeds found in samples of analyzed by a seed lab;

- Broadcast versus seed drills shall be utilized. If the area has minimal disturbance then broadcast the seed but use a packing wheel attachment or covered chains dragged over the seed to enhance contact with the soil;

4.5.3 Operational Considerations

- Avoid driving vehicles across infestations. Fence off areas of infestation if necessary;
- Ensure imported materials (gravel, clay) are free of vegetative matter and soil. Avoid importing straw because it is very difficult to assess for weeds;
- Ensure equipment used during treatment programs is clean and free of any weed debris before entering the area that has been treated.

4.5.4 Chain of Custody

Successful implementation of the weed management program is dependent on awareness and participation by all parties active in the pasture and immediate surrounding area. It requires commitment from management, planning, communication, training, reporting and follow-up.

Celtic Current's Vegetation Management Policy guidelines will include:

- If landowners manage or implement a vegetation control program on surrounding lands, during the planning process Celtic Current will solicit their participation in a cooperative weed management program;
- Only licensed applicators licensed in the jurisdiction in which the lands are located may enter upon and treat vegetation on a Celtic Current site;
- The Senior/Lead Operator, in consultation with the Environmental Co-coordinator and licensed contractor, shall specify the herbicide (mixture) to be used on the access road, turbine pad, or other facilities;
- The Senior/Lead Operator shall insure that the contractor complies with all Workplace Hazardous Material Information System requirements, and that the contractor has a spill response plan and appropriate spill response equipment in place;
- The Senior/Lead Operator shall review site-specific environmental sensitivities with the contractor as part of the required project Pre-Job Meeting;
- Celtic Current employees will fulfill the day-to-day components of the weed management program.

4.5.5 Procedures for Vegetation Control

Celtic Current will use information collected in prior seasons to evaluate the infestation of noxious and invasive species over time and prepare a weed treatment plan for operations in the upcoming year.

As no one method of vegetation control may be effective, the following procedures will be implemented in a synergistic manner for all Celtic Current operations on project lands:

- The most effective and least costly method of weed control is to prevent their establishment;
- Integrated weed management may combine chemical, mechanical and natural controls with each measure implemented as needed. Treatments should not be employed on a scheduled basis but used in response to a situation identified during past monitoring;
- After a site has been cleared, prepared and seeded, regular monitoring and weed pulling is necessary in order to keep the site from being overrun by undesirable plant species. This prevents extensive root systems from forming. Once established, these root systems become extremely difficult and costly to remove completely;
- Preventative control must be incorporated for all operations. Construction machinery used in decommissioning is to be washed before entering work areas. This is to help prevent spread of nuisance, restricted or noxious weeds;
- Monitoring of the areas over a 2-5 year period (if location undergoing reclamation) or during the lifetime of a facility, is required to alleviate problems as they occur or until weeds are controlled and vegetation is established as appropriate. As monitoring occurs, disturbed areas will also be checked for new occurrences of weeds, and appropriate control methods will be applied to any outbreaks;

4.5.5.1 MOWING

- Celtic Current may rely on mowing as an effective form of weed control in the area;
- Repeated mowing controls perennial weeds by depleting root reserves. It will also prevent seed production of annual and biennial weeds;
- If only one mowing is planned, it should be completed during the budding stage of perennial weeds;
- Mowing must be completed early in the season, before vegetation sets seeds and multiple mowing treatments may be utilized;
- Mower selection will also be considered. Rotary mowers with one or more horizontal blades will cut plants at the highest setting above ground level to reduce potential impacts to nesting species. Lightweight mowers may be used to cut herbaceous weeds;
- Mowing will be completed during the construction phase and may be ongoing through operations as part of the Weed Management Program;
- To prevent conflicts with nesting birds, the *Migratory Birds Act* and *Species at Risk Act,* and still maintain effective weed control, mowing will not be completed during the critical breeding season and will be completed after July 15 unless vegetation characteristics dictate mowing within the time frame. Where weed control requires earlier intervention, field surveys will be done to identify active nests or other conflicts so that these may be avoided during the mowing operations;
- Direct impacts to vegetation will be limited to within the surveyed boundaries of the access and turbine pad boundaries. Mowers will travel off trails while mowing but otherwise will utilize existing access roads, minimizing additional soil disturbance.

4.5.5.2 HAND PULLING

- Hand pulling may be effective for small patches of perennial weeds however it is most effective for annual and biennial weeds. Pulling of annual weeds prevents seed production. If weeds are in flower, bag and dispose of them at an approved garbage facility to prevent seed spread;
- Hand pulling is most effective when you are trying to prevent the establishment of new species;
- Pulling and digging individual plants may be used to eradicate very small-scale infestations;

4.5.5.3 CHEMICAL CONTROLS

- Herbicide application that results in soil sterilization is strictly prohibited;
- Always notify adjacent landowners/occupants prior to the application of herbicides;
- If required permits will be obtained from regulatory bodies for the application of herbicides within 30 metres of an open water body. Pesticides must not be stored, mixed or equipment cleaned within 30 metres of an open body of water;
- Herbicide drift is a concern for ground application. Contractors are responsible for ensuring that any herbicide applications conducted are done so in a safe and responsible manner. The choice of chemical should be made with adjacent land uses in mind;
- Herbicides should not be sprayed when winds are excessive (winds over 16 km/hr are considered a drift hazard). Applications should occur only when winds are blowing away from water bodies, sensitive sites, or areas of concern (as identified by regulators and/or landowners). Conditions of temperature inversions should also be avoided;
- Presently, chemical control is accomplished through low-volume application of approved herbicides directed specifically toward weed species. The herbicide application is performed primarily with backpack sprayers, although some applications have been completed with hand-held nozzles attached to hydraulic truck-mounted sprayers via a rubber hose. Regardless of the specific spray equipment, reasonable efforts must be made to minimize impacts to desirable low-growing shrub and herbaceous species present. Low-volume applications entail lightly wetting of the foliage of undesirable woody species. The herbicide is then transferred throughout the plant, including into the roots, resulting in the death of the plant. Since foliar herbicide application requires leaves on the target plant, this method of herbicide treatment is performed only during the summer months when the vegetation is actively growing. There is very little impact to adjacent vegetation or the environment due to the limited amount of herbicide applied, the selected application to only undesirable weeds, and the careful selection of the herbicide mixture;
- During rainfall, herbicides are moved from land into waterbodies by runoff. The occurrence of herbicides in the waterbodies depends on the intensity and timing of the rainfall and location and timing of herbicide applications. Herbicide application requires extra care and caution to ensure water quality, and aquatic and riparian habitats will not be affected by the application. Natural vegetation should be left along natural water bodies to ensure bank stability and to provide a natural buffer and filter for chemicals;

4.5.6 Monitoring

Monitoring of locations is required to alleviate problems as they occur or until weeds are controlled and vegetation established as appropriate;

4.5.7 Protection of Flora & Fauna SARA Species during Vegetation Management

- In order to comply with the SARA and MBCA, as a requirement of the regulatory approval process, Celtic Current has already conducted flora and fauna assessments on the affected lands;
- The data collected during those assessments will be used to identify known, probable, or other habitat types, species at risk locations, and the likelihood of species at risk occurring within a specific area (i.e. LSD, section, etc…). The information collected in the preliminary stages will be used to create effective vegetation management strategies that avoid or protect species at risk, and ultimately comply with SARA and MBCA;
- For example, vegetation requiring control may require mowing but occur within a setback distance identified in assessments. In that instance, hand spraying or tillage, or weed pulling may be an appropriate response;
- As with any effective management strategy, Celtic Current's vegetation management strategy will be dynamic and require thoughtful execution.

4.6 Culvert Maintenance

All maintenance will be carried out in accordance with the *Nova Scotia Watercourse Alteration Specifications (2006)* or updated versions thereof.

4.6.1 Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs;

4.6.2 Limit the removal of accumulated material (i.e., branches, stumps, other woody materials, garbage, etc) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function;

4.6.3 Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and reduce the amount of sediment-laden water going downstream.

5.0 SITE RESTORATION PLAN (SRP)

The objective of the SRP is to remove all garbage from site, control erosion as may be necessary, restore soil capability, and reclaim the project areas and associated disturbed portions to a land capability which is equivalent to pre-disturbance characteristics.

Reclamation will take place once construction equipment has left the location or as soon as soil and weather conditions permit. The landowners will be notified prior to the initiation of the reclamation activities and again upon completion. Reclamation success is dependent on good landowner communication and upon favourable conditions in the root zone for optimum crop growth. The key soil factors that determine root zone quality include the water holding capacity, organic content, structure and consistence, salinity, nutrient balance and soil regime.

5.1 Interim Reclamation

Celtic Current shall attempt to reclaim all disturbed land surfaces within 2 growing seasons. Interim reclamation, including site and debris clean-up, slope stabilization and re-contouring with subsoil, and spreading of topsoil shall be done progressively and concurrently with operations.

Reclamation of the sites during production requires re-contouring the non-use portion of each surveyed pad area.

The subsoil will be used to re-contour each site to allow natural drainage patterns to exist without creating slopes that have the potential for erosion.

Any unexpected disturbances that occur outside the immediate working area of the sites will be reclaimed to pre-development conditions immediately.

5.2 Final Project Reclamation

Timeline

Decommissioning	**Activity**	**Timeline**	**Off Site Land Use Requirements**
Turbine	Removal of tower and turbine infrastructure	May – July	Use provincial, municipal or private roads for access to water or soils; May require temporary work space for equipment storage prior to removal from project lands; Use of water from local sources for reclamation purposes; Reclamation of borrow
	Removal of transformer	May – July	
	Partial excavation and removal of cement base to depth >1.5 meters	June – July	
	Removal of gravel pad and gravel from access	July – August	
	Recontouring of pad and access road	July – August	
	Reclamation of surface soils	August – September	
	Re-seeding	September -	

		October	pits at pre-approved locations; Use of landfill or recycling activities for equipment/waste disposal.
Power Lines/ Transformer Station	Removal of above ground poles and lines	May – July	
	Removal of transformer station and associated infrastructure	May – July	
	Removal of gravel pads	June – July	
	Removal of interconnection lines and infrastructure	July – August	
	Removal of access roads	July – August	
	Recontouring of pad and access roads	August – September	
	Reclamation of surface soils	September - October	

Soils

- Upon cancellation and abandonment of the location, all disturbed areas are to be re-contoured to pre-construction conditions. Loading of slopes with unconsolidated material will be avoided during slope re-contouring;
- All grades and drainages will be restored by removing any culverts and fills;
- Topsoil replacement should not be done until all subsoil leveling and cleanup has been completed, to prevent mixing by leveling after topsoil replacement;
- Surface diversion berms will be installed, as required. Run-off will be diverted to stable and vegetated off-right-of-way areas;
- In areas that have compaction problems, rip compacted subsoils, with a multi-shank ripper to an approximate depth of thirty (30) centimetres. Postpone ripping until subsoils dry out so that they fracture when ripped. Disc ripped subsoils to smooth the surface. Limit discing to that necessary to break up clods so as to minimize the potential for further compaction;
- Remove all foreign materials including geotextile;
- Bridges, fences and culverts are to be restored to meet or exceed pre-construction conditions;
- Rocks/stones exposed on the surface as a result of construction activity will be removed from the right-of-way prior to and after topsoil/surface material replacement. The concentration of surface and profile rocks will be equivalent to, or better than the surrounding fields. Rocks/stones will be disposed of at a site approved by the landowners;
- Any areas with rutting or erosion gullies will be re-contoured and all strippings will be replaced evenly over all portions of disturbed areas. Replacement of soils during wet

weather or high winds will be avoided. This will prevent damage to soil structure and reduce the potential for erosion of topsoil;

- Once sub-soil has been adequately reclaimed, topsoil will be replaced. Replaced topsoil will be disced to alleviate compaction and break up aggregates then harrowed to create an adequate seed bed;
- Erosion control in the form of matting, hale bales and/or cross ditching may be necessary on slopes;
- Complete re-contouring and stabilization of disturbed areas. Smooth water channeling ruts and outside berms. Ensure that all erosion control and water management measures (e.g. water bars, drainage dips, culverts and ditches) are working;
- If grading or other earthwork is required to facilitate vehicle/equipment on areas, strip and salvage topsoil and organic material for replacement during clean-up procedures;
- Complete scarification of the disturbed areas with disc or multi-shank ripper;
- Replace soil material and surface strippings from the down slope locations;
- Where soils have been disturbed, implement appropriate reclamation procedures (i.e. seeding, erosion blankets, slash rollback, straw crimping, etc.) to promote stability of the site, soil preservation, and plant re-establishment. Ensure the natural drainage is restored;

Vegetation

- Once topsoil has been re-distributed, disturbed areas will be re-seeded, as soon as weather permits, with an approved Canada #1 Certified Seed mixture from a local source. The Certificates of Analysis will be retained for documentation. Seed mixture design will be based upon observations of vegetation species in surrounding areas, discussions and recommendations put forth by the landowners and regulators, and availability of seed mixtures;
- Cover crops may be planted in areas requiring seeding of natives. If native vegetation seeding is to occur in the fall, plant the cover crop in the spring of the same year;
- Additionally, disturbed areas will likely require perennial species for long-term protection. The seed mix approved by the regulators and/or landowners/occupants will be used on all disturbed soils. The contract inspectors will mark these areas needing seeding on survey maps, so that crews can easily locate the areas and apply the seed as soon after disturbance as possible. In areas away from water, and where natural seed sources are available, contractors may depend on natural seeding.
- Seeding rates and methods will be based upon characteristics of the area, weather conditions, erosion potential of slopes, and landowner recommendations;
- Fertilizer may be needed in some cases but will not be applied unless approved by regulators and/or landowners;
- Locations should be monitored monthly during growing seasons. Typical monitoring should occur in June, July, and August. Monitoring will consist of visually inspecting the

areas to ensure vegetation has been established and is healthy, erosion has been mitigated, and landowner concerns have been adequately mitigated;

- Restore gates and fences;

6.0 Monitoring Program for Surface Water Impacts

6.1.1 Celtic Current's Commitments

As part of its environmental program, Celtic Current has made the following commitments regarding monitoring the project for surface water impacts during construction; operations; and maintenance:

- Celtic Current will conduct visual inspections, both quarterly, and after severe storm events, on the site to ensure the effectiveness of erosion and sedimentation controls;
- If issues are noted during these assessments, Celtic Current. will take the necessary steps to ensure erosion and sedimentation controls are repaired, replaced, upgraded, or installed as necessary;
- Celtic Current will provide summaries of the monitoring program to NSE on a quarterly basis, and reports will be submitted to NSE within 30 days from the last day of the preceding quarter;
- If an immediate or large scale impact is noted following a severe storm event, updates may be provided to NSE at that time;

7.0 Spill Response

Celtic Current recognizes its responsibility for its operations and the effects that these operations have on employees, landowners, the public and the environment. Although facilities and operating procedures are designed to prevent upsets that could result in a spill, spills may occur.

To a large extent, effective spill response is dependent on the amount of planning that is undertaken before a spill occurs. Sound planning will help reduce the number of spills, improve the success of response activities, reduce environmental impact, decrease conflict with regulatory agencies and the public, and lower spill response costs. Spill planning is a continuous process that requires commitment, cooperation and input. Components of planning include:

- Company policy and spill strategy;
- Spill prevention;
- Contingency plans;
- Equipment readiness (know local contractors);

Celtic Current will take immediate action to control a spill including:

- Shut in the source of the spill and start documentation;
- Assess the spill;
- Initiate containment and recovery;
- Protect the public and worker safety;
- Supervise the spill clean-up;
- Prepare status reports;
- Remediate and reclaim the affected area; and
- Conduct a de-briefing session to help prevent a similar incident.

Celtic Current's policy in regard to spill planning and control operations involves:

- Authority to initiate emergency actions;
- Reporting structures for notification and approvals;
- Authority for expenditures related to spill activities;
- Authority to activate additional resources as needed;
- Authority to respond to unidentified spills.

If a spill occurs, a single authority will immediately assume overall responsibility for coordination of response actions. For small spills one individual can oversee the entire operation, especially if that individual can obtain advice and support from internal resources, spill specials, regulatory staff and others.

7.1.1 Containment and Recovery

Once a spill has occurred, it is important for Celtic Current to initiate a well-organized response that includes shutting in the source, initiating containment and recovery, clean-up and reclamation. As no two spills are alike, it is impossible to provide a rigid set of instructions. Trained personnel must adapt to the unique circumstances of the spill and use available resources. If one technique fails, a new approach or improvisation of existing methods must be attempted. In general, spill response should be approached as follows:

- **Spill notification** - is the starting point for initial response. Documentation starts at this stage and must be continued until the site is reclaimed. Activate the spill contingency plan, mobilize resources, confirm spill and shut-in the spill source;
- **Assessment of incident factors** - includes the identification of hazards associated with the incident (hazard assessment), the site assessment and security of the impact.

- **Set objectives** – following the site assessment, the response team should develop an action plan that includes clear and concise objectives. The priorities are to protect human life, property and the environment. An action plan that outlines objectives will likely be developed by company personnel with input from regulatory agencies**;**
- **Incident control** – includes containment, recovery and spill management with a focus on communication. Control is accomplished by having a defined incident commander with authority and availability to resources;
- **Evaluation** – the spill response must be evaluated on a continuous basis and changes made to the action plan if necessary. The entire response team must be briefed when changes occur.

7.1.2 Containment and Recovery Techniques

- **Dikes, bellholes, trenches** – the most common method of containing a land spill is to use a combination of dikes, bellholes and trenches around the spill perimeter, with feeder trenches inside the spill itself to move fluids towards a recovery area. Feeder trenches can be constructed by hand or mechanical excavation only when the area has been deemed safe and continuous monitoring is undertaken.
- **Inverted weirs** – this technique is used when it is necessary to allow the natural movement of water to leave the spill site. An inverted weir consists of an earthen berm supported with sand bags or a plastic liner and the appropriate-sized culverts on an angle to contain oil inside the spill perimeter.
- **Filter fences** – can be constructed with pins and chicken wire or snow fence and bales (straw or hay). Filter fences can be effective to contain spills without severely affecting the natural movement of water.
- **Sorbent** – It may be appropriate to use a combination of natural sorbents (like straw or hay) with commercial synthetic sorbents. The overuse of sorbents can create a disposal problem and generate unnecessary waste.
- **Ice-slots** – in general, oil spilled under solid ice will flow with the current, with significant portions becoming trapped in pockets under the ice. The containment and recovery technique involves creating an opening in the ice (ice-slot) downstream of the spill and then recovering accumulations or removing ice from the opening, back to the source point of the spill. In using this technique it is important to follow the following steps:
    - Assess the weight-bearing capacity of the ice, water depths and current patterns;
    - Locate the ice-slot such that it is at an angle to the current (30 degree maximum) with a slight “J” into the main current to promote the movement of oil towards the recovery area;
    - Construct the ice-slot using backhoes, chain-saws or ice-augers providing the ice weight-bearing capacity is adequate and there are

no flammable vapours under the ice. The ice slot should be approximately .75m or 2ft wide;

- o Place a skimmer or vacuum unit in the ice-slot;
- o Recover accumulations or pockets of oil and contaminated ice. Consider in-situ burning as an alternative;
- o If there are natural openings in the ice it may be possible to use booms and skimmers. Caution should be taken when working in these natural conditions with respect to weight-bearing capacity.

7.1.3 Spill Waste Disposal

- Waste materials that are generated from a spill should be minimized and managed so that there are no long-term problems with disposal. The following are some of the common waste materials associated with spills and some options for disposal:

- **Contaminated fresh water** – removal and hauling by vacuum truck to an approved disposal facility;

- **Contaminated soil** – excavation by machinery or hand, loading, hauling, and disposal at an approved disposal facility

- **Vegetation/sorbents** – incineration, approved landfill;

- **Garbage** – incineration, approved landfill;

- **Construction materials** – clean and reuse, approved landfill, incineration;

- **Contaminated ice and snow** – store in secure containment until ice melts and recover spilled product for disposal.

8.0 Training/Contingency Planning/HSE

Celtic Current has a Corporate Health Safety & Environment Program which will be followed during construction, operations, and maintenance. The HSE Program outlines procedures for training, reporting and contingency planning and is summarized below:

8.1 ORIENTATION FOR NEW EMPLOYEES

Each new employee and contractor will have an orientation familiarizing him/her with ***Celtic Current*** Safety Policy, Probationary Period, Terms of Employment-plus work instructions and process sheets pertinent to the job. Every reasonable attempt will be made to ensure these are understood before contractors and employee signs acceptance and begins work.

PROJECT SITE SPECIFIC ORIENTATION: Contractors & Employees (Conducted by Site Manager or Supervisor)

Items Covered:

Celtic Current Safety Policy and Expectations
Contractors (manager, supervisor and employee) responsibility
Hazard identification specific to the project and site
Environmental protection requirements
Personal Protective Equipment (PPE) as required
Equipment, machinery safety
Training and training documentation required
Tailgate meetings conducted and documented
Near-Miss, Incident, Accident reporting and documentation
Emergency plan and procedures
List of all hazardous chemicals to be brought on site (MSDS)
Safe work procedures required

TRAINING: Contractors & Employees

Job, equipment specific training (is each employee trained, competent to do the job – is that training documented)
Safe work procedures are in place and employees trained on the procedures
First Aid training as required
Training for employees on Rights and Responsibilities (OH&S Act.)
WHMIS Training (chemical identification, safe handling procedures, MSDS knowledge and location)
Transportation of Dangerous Goods (TDG)

TRAINING SCHEDULE

Job specific training updated as required
WHMIS training (review yearly)
First Aid (up-dated as required)
TDG (every 3 years)

8.2 SAFE WORK PROCEDURES

Job specific, safe work procedures prepared and employees trained
All employees are encouraged to recognize, identify, and suggest improvements to the safety work procedures.

8.3 HAZARD IDENTIFICATION

JOH&S Representative or JOH&S Committee:

The JOH&S Representative or the individual members of the JOH&S Committee, will conduct informal audits on a daily basis.

The JOH&SC will conduct a formal audit / inspection once a month prior to the regular meeting.

Employees:

Each and every employee, contractor and contract employees are expected to conduct an informal audit / inspection of their work area to identify hazards daily before starting work. (How can I get hurt here today and how can I prevent that from happening).

PROCEDURE FOR CONTROLLING IDENTIFIED HAZARDS

Eliminate:

Where possible the hazard will be eliminated.

Guard and/or control:

Where elimination is not possible the identified hazard will be guarded and/or controlled using recognized engineering methods and/or safe work procedures.

Personal Protective Equipment (PPE):

Where the identified hazard cannot be eliminated or controlled with engineering methods Personal Protective Equipment will be required.

TRACKING & MONITORING THE RESULTS:

Worker's Compensation figures will be monitored to track the results of our safety program.

Hazard / Near - miss / Incident / Accident and Solution reports will be tracked and monitored.

NOTE: ***This OH&S Program has been developed in co-operation with the Occupational Health and Safety Representative.***

Appendix I: Inquiry & Complaint Reporting Procedures

Inquiry & Complaint Reporting Procedures

Celtic Current has developed a procedure for receiving, recording, investigating, resolving and reporting public inquiry or non-compliance events which may occur from time to time on the Mulgrave Community Wind Power Project. One of the key outcomes of the process is to ensure there are steps taken so that Celtic Current can learn from our experiences and maintain diligence in its ongoing operations.

Celtic Current is implementing a Contact Management Program to:

- Record enquiries, comments and complaints;
- Develop, manage and record responses to enquiries, comments and complaints;
- Support data collection and reporting requirements;
- Support communication, liaison and notification activities;
- Record communication, consultation and liaison activities;
- Assist the project team in managing issues;

Celtic Current will handle all comments and complaints concerning the Mulgrave Community Wind Power Project in a timely and prudent fashion.

Procedures

Celtic Current will manage the contact management data with responsibility to:

- Track and report out on enquiries and follow-up actions required; and
- Coordinate responses to enquiries.

Public Complaints

Complaints will be considered either reportable or non-reportable as follows:

- **Reportable** – An expression of concern or inquiry related to a specific topic or event that is related specifically to Celtic Current's operations and requires Celtic Current to take corrective action;
- **Non-Reportable** – An expression of concern or inquiry related to general industry-related activities, and includes non-project specific issues and concerns. These complaints typically will not require action by Celtic Current Responses to Non-Reportable public complaints will be as described in Sections 1, 3, 4, 11, and 12 below.

Recording

1. Public or regulatory concerns and enquiries will be recorded by the person(s) receiving the complaint. Any person witnessing, or involved in, an event shall report it verbally to their supervisor and on an Inquiry/Complaint form.

2. If required by regulations or the terms and conditions of approval the appropriate/designated person(s) shall immediately report the event to appropriate regulatory authorities.

Management

3. Recorded information will be provided to the Celtic Current Chief Operating Officer (COO), or person(s) delegated by the COO to receive such information;
4. The recorded information will be entered into Celtic Current's internal Contact Management Database within 96 hours of occurrence outlining the circumstances as known at that time and indicating what further investigations may be required. Responses will be as indicated below.

Resolution

5. Celtic Current will designate person(s) for ensuring that a Reportable Public Complaint is addressed, as outlined in this document. Celtic Current will acknowledge receipt of Reportable Public Complaints within 5 business days of receiving the complaint back to the complainant or inquirer.
6. Toward resolution, Celtic Current will evaluate the root causes of the complaint, investigate the issue(s) and report the findings back to Celtic Current management.
7. If resolution of the complaint can be handled in the 5 business day time frame (indicated in Step 5) Celtic Current will include information related to the response with the acknowledgement of receipt.
8. Celtic Current will make suitable efforts to resolve complaints and inquiries through thoughtful and timely responses or negotiations with complainants or inquirers.
9. In such a case that Celtic Current commits to implementing a solution, Celtic Current shall inform the complainant of the expected time frame for implementation.
10. An issue is "resolved" where Celtic Current has considered complaints and inquiries in good faith and has formulated and implemented, or committed to implementing, the appropriate solutions in a time frame acceptable to both parties.

Communicating Responses

11. Responses will be coordinated and provided by Celtic Current in a manner appropriate to the type of inquiry, and may include:
    - Meetings in person
    - Telephone calls
    - Emails
    - Letters

Record Keeping

12. Documentation to support recording, management, resolution and communication response standards shall be filed in accordance with the Celtic Current Corporate Records Management Program.

13. Celtic Current will use its Contact Management Database to record Reportable Public Complaints [and Regulator Inquiries], acknowledgements of receipt, and responses to any such complaints. The database will ensure accurate records maintained and will be used to develop required reports.

Self Auditing

14. Within 90 days of a Reportable Public Complaint being entered into the Contact Management Database, Celtic Current shall review the file to verify that the resolution has been achieved.
15. Unless a file in the Contact Management Database is referred to mediation or becomes the subject of a judicial proceeding or an arbitration, any outstanding actions under this process shall be audited every 90 days until the file is resolved.

Mediation

16. If the Self Auditing demonstrates that a Reportable Public Complaint has not been resolved through the resolution process herein, and subject to Sections 17 and 18, below, Celtic Current will engage a mediator who will be responsible for attempting to facilitate an agreement of resolution between Celtic Current and a complainant. Celtic Current will therefore send a notice of mediation to the complainant within 5 business days of having completed the Self Auditing.
17. Engagement of the mediator under Section 16, above, is conditional on the complainant providing agreement in writing to participate in mediation upon receiving notice of mediation from Celtic Current
18. Mediation is not required where, after the first 90-day audit period, the issue has been resolved.
19. The “Mediation Period” is the later of 30 days from the issuance of the notice of mediation or a date to be agreed on in writing by Celtic Current and the complainant in question.

Alternative Dispute Resolution

20. In lieu of mediation or if no agreement is reached through mediation within the Mediation Period, Celtic Current will consider other appropriate forms of alternative dispute resolution. Alternative dispute resolution may include, but is not limited to, arbitration.
21. Where Celtic Current identifies arbitration as an appropriate dispute resolution mechanism, it shall follow the applicable procedural rules set out in the

Arbitration Act, R.S.N.S., c. 19, s. 1, if the complainant agrees to the following terms:

a) All arbitration costs due in advance of a decision from an arbitrator or umpire shall be paid by each party submitting to arbitration in equal parts;

b) Where payment of arbitration costs are specified, billed or estimated prior to the decision from an arbitrator or umpire, but are not due until after a decision is rendered, the complainant's portion shall be submitted and held in trust to the benefit of Celtic Current for the duration of arbitration; and

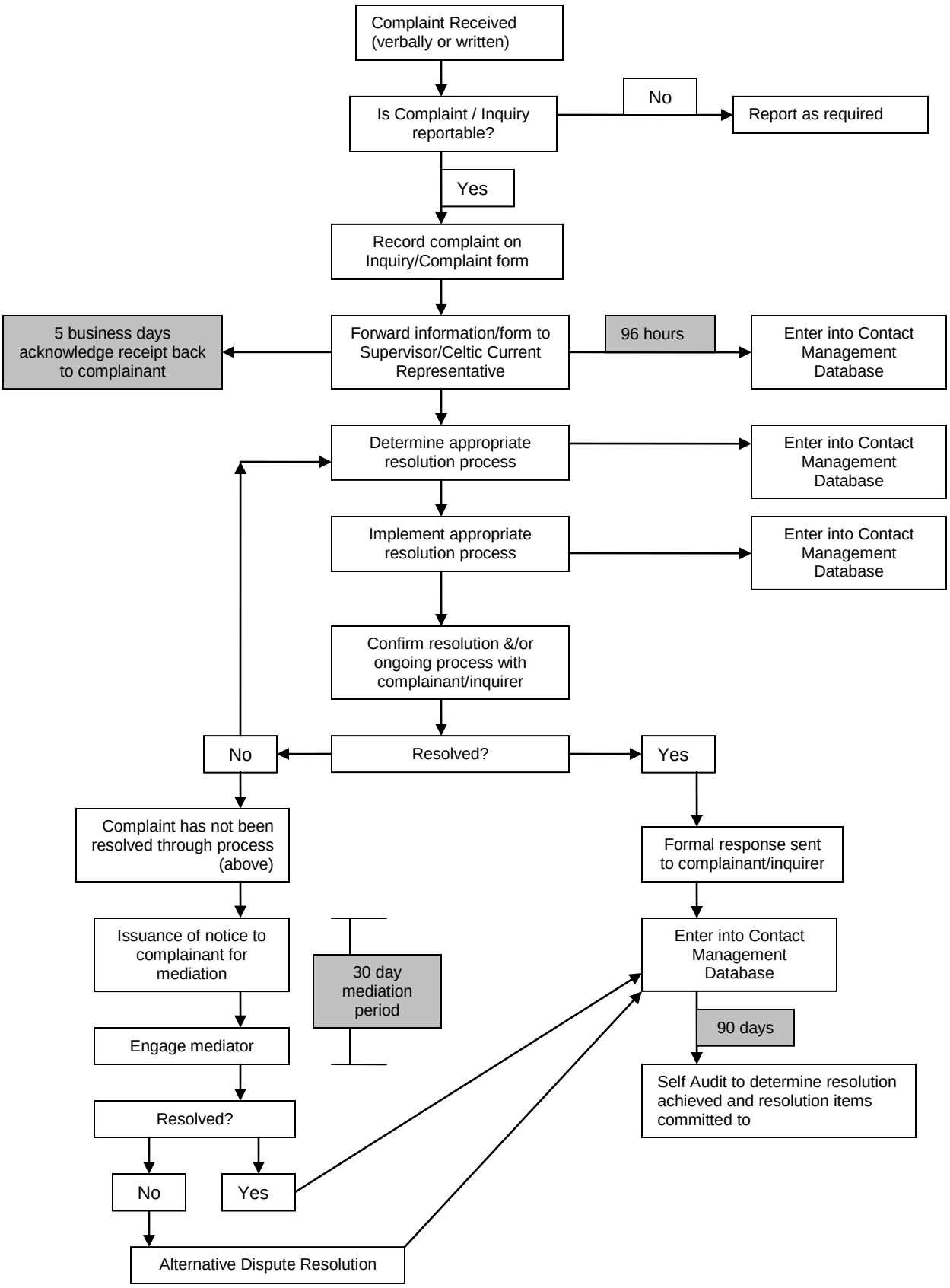
c) If non-binding arbitration is identified as the appropriate alternative dispute resolution mechanism, and unless otherwise agreed to and specified by Celtic Current and the complainant, only the provisions relating to timelines and selection, removal and misconduct of arbitrators, umpires and referees shall apply. To be clear, unless otherwise agreed to and specified by Celtic Current and the complainant, the decision or award made by an arbitrator or umpire shall not be final and binding on the parties and agreement to non-binding arbitration does not constitute "submission" under the *Arbitration Act*, R.S.N.S., c. 19, s. 1.

Contact Information Provided to the Public

The Celtic Current corporate website will provide advice on how to contact Celtic Current to register concerns and complaints.

Flow Chart

See following page.


Complaint Received (verbally or written)
Is Complaint / Inquiry reportable?
No
Report as required
Yes
Record complaint on Inquiry/Complaint form
5 business days acknowledge receipt back to complainant
Forward information/form to Supervisor/Celtic Current Representative
96 hours
Enter into Contact Management Database
Determine appropriate resolution process
Enter into Contact Management Database
Implement appropriate resolution process
Enter into Contact Management Database
Confirm resolution &/or ongoing process with complainant/inquirer
No
Resolved?
Yes
Complaint has not been resolved through process (above)
Formal response sent to complainant/inquirer
Issuance of notice to complainant for mediation
30 day mediation period
Enter into Contact Management Database
Engage mediator
90 days
Resolved?
Self Audit to determine resolution achieved and resolution items committed to
No
Yes
Alternative Dispute Resolution

APPENDIX I INQUIRY / COMPLAINT FORM

INQUIRY / COMPLAINT FORM	
Date of Inquiry:	Time:
Name of Person Taking Inquiry:	Title:

Name of Person(s) Making Inquiry/Complaint:
Mailing Address:
Phone Number of Person(s) making Inquiry:
Other Number (specify):
Email Address:

Inquiry or Complaint Details:

Inform the person that Celtic Current will respond within 5 business days.

CHAIN OF CUSTODY:

1. Person Taking Complaint: _____ Signature

2. Person Accepting Complaint form from #1.

Name **Signature** **Date**

3. Person Responsible for Resolution

Name **Signature** **Date**

Appendix II: Spill Report Form

Spill Report Form

AREA _____ LOCATION _____

LANDOWNER _____ PHONE # _____

OCCUPANT _____ PHONE # _____

INCIDENT DATE _____ SPILL TYPE _____

SOURCE OF SPILL _____ REASON FOR SPILL _____

SPILL VOLUME (m^3) _____ VOLUME RECOVERED (m^3) _____

ON-LEASE AREA AFFECTED (m^2) _____

OFF-LEASE AREA AFFECTED (m^2) _____

METHOD OF RECOVERY _____

DISPOSAL LOCATION _____

SPILL REPORT SUBMITTED TO REGULATORY AGENCY: q YES q NO DATE: _____

SPILL LOCATION AND DETAILS:

Appendix II. PRIORITY LIST OF SPECIES FOR FIELD ASSESSMENTS

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Accipiter gentilis	Northern Goshawk				YELLOW	Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season, which vary among forest types and region. Typically nests in mature or old-growth forests, and generally selects larger tracts of forest over smaller tracts.
Caprimulgus vociferus	Whip-Poor-Will	T			RED	Arrives in the Maritimes in May and leaves for its wintering grounds in August-September. Breed in fairly open or patchy forests, often in relatively dry sites associated with sand plains or rock outcrops and having substantial cover of white and red pine and red oak and sometimes in sites that area regenerating following major disturbances. In the Maritimes, most records are from central and western NB. 0ther areas may support the occasional territorial bird
Sturnella magna	Eastern Meadowlark				YELLOW	Breeds from southeastern Canada through eastern U.S. west to Arizona; resident in the Bahamas and Mexico. Spends winters mostly within breeding range. Preferred habitats include pastures, meadows, grassy fields, prairies, open country and country roadsides. Often seen singing from fence posts or utility wires.
Cathartes aura	Turkey Vulture				YELLOW	Breeds from southern B.C., central Saskatchewan, the Great Lakes, and New Hampshire southward. Spends winters in the Southwest and eastern U.S. northward to southern New England. Preferred habitats include deciduous forests, woodlands and scrublands; often seen over adjacent farmlands.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Sayornis phoebe	**Eastern Phoebe**				**YELLOW**	**Breeds north of Mason-Dixon lines in North America; spends winters as far north as the Ohio River.**
Chordeiles minor	**Common Nighthawk**	**T**	**T**	**Threatened**	**RED**	**Nest throughout Maritimes with the exception of PEI. Nest on the ground in a variety of habitats having little or no tree cover and a limited cover of taller shrubs and herbs, and then can also nest on flat gravel roofs in urban settings. Forest clearings created by forestry or fire are probably the most widely used habitats in the region, but sand dunes, river bars, open forests, commercial blueberry fields, mining and aggregate excavation sites, rocky outcrops and drier peat lands are all potential nesting habitats. Easily observable at dusk or dawn- as they forage in the air for insects.**
Asio otus	**Long-eared Owl**				**RED**	**Occurs Throughout the northern hemisphere. Preferred habitats include dense vegetation close to grasslands or shrub lands, as well as open forests.**
Myiarchus crinitus	Great Crested Flycatcher				RED	Uncommon with few confirmed breeding records broadly scattered over central and southern Nova Scotia. Breeds in deciduous forest (mainly), mixed, or pine woodland or somewhat open forest, parks, orchards, wooded residential areas, areas of scattered trees in cultivated regions, clearings and edges of wooded areas, and swamps. Preferred perches are tall trees, but may also be found on utility lines and short shrub-like growth in recent clear-cuts. Nests in natural cavity or old woodpecker hole in live or dead tree, average of 3-6 m above ground; also in bird box, pipe or similar cavity

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Falco peregrinus anatum	American Peregrine Falcon	SC	SC	Vulnerable	RED	Breed around the Bay of Fundy shore, both in NB and NS on cliff ledges at sites where there is a steady supply of mid-sized birds such as small ducks or shorebirds. Ledges on tall buildings and bridges can also serve as suitable nest sites in urban areas.
Hirundo rustica	**Barn Swallow**				**YELLOW**	**Breeds from Alaska east across Canada to Newfoundland and south throughout most of the U.S.; spends winters in the tropics and Eurasia. Preferred habitats include agricultural lands, suburban areas, marshes and lakeshores.**
Petrochelidon pyrrhonota	**Cliff Swallow**				**RED**	**Cliff swallows inhabit open to semi wooded habitat, cliffs, canyons, and farm country, generally near meadows, marshes, and water. They build bottle-shaped mud nest in colonies on cliffs, under eaves of buildings, under bridges, and similar sites sheltered by an overhang. Many return to same nesting area in successive years, but colonies tend to switch nesting sites between seasons, evidently due to a buildup of insect parasites in the nests. Cliff swallows commonly repair and use old nests. Breeding bird in NS**
Riparia riparia	**Bank Swallow**				**RED**	**Habitat includes open and partly open situations, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks, in burrows dug near the top of the bank, along the edge of inland water, or along the coast, or in gravel pits, road embankments, etc. Breeding Bird NS**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Falco peregrinus	Peregrine Falcon				YELLOW	Breeds from Alaska and the Canadian arctic south locally through the mountainous west, and sparingly in the east. Spends winters on coasts north to B.C., and Massachusetts. Preferred habitats include tundra, savannas, coasts, mountains, and tall buildings.
Contopus cooperi	**Olive-sided Flycatcher**	**T**	**T**		**RED**	**Breeds throughout the maritime provinces. Is most associated with openings or edges in coniferous forest containing tall trees or snags for perching. Bog margins, river valleys, beaver ponds and meadows, slow moving streams with broad floodplains and cut over areas with some standing trees are frequently used habitats.**
Contopus virens	**Eastern Wood-Pewee**				**YELLOW**	**Breeds from eastern Great Plains to the Atlantic ocean, ranging from southern Canada to northern Florida, the gulf coast and central Texas. Winters in the tropics. Preferred habitats include northern hardwood, pine-oak, oak-hickory, bottomland hardwood, southern pine savannah, and Midwestern forests; also found in orchards, parks, roadsides and suburban areas.**
Dendroica castanea	**Bay-breasted Warbler**				**YELLOW**	**Breeds from northeastern B.C. east to Maritime provinces and south to the northern Great Lakes region and northern New England. Spends winters in the tropics. Preferred habitats include open spruce forests and deciduous woodlands.**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Dendroica striata	**Blackpoll Warbler**				**YELLOW**	**Breeds from Alaska and northern Canada to southern Canada and northern New England. Spends winters in the tropics. Preferred breeding habitat is coniferous forests; during migration found chiefly in tall trees.**
Dendroica tigrina	**Cape May Warbler**				**YELLOW**	**Breeds from southern Mackenzie, Manitoba, Ontario and Quebec south to North Dakota, Michigan, northern New York, Maine and Nova Scotia. Spends winters in southern Florida and the West Indies. Preferred habitats, but during migration also found in evergreen or deciduous woodlands, and often parks or suburban yards.**
Empidonax flaviventris	Yellow-bellied Flycatcher				YELLOW	Breeds from central Canada and Newfoundland south to Great Lakes region, northern New York, northern New England, and maritime provinces. Spends winters from Mexico to Panama.
Empidonax traillii	Willow Flycatcher				YELLOW	Breeds from southern B.C., Ab., North Dakota, New York, and Maine south to central California, Nevada, the southwest, Arkansas, and Virginia. Preferred habitats include swampy thickets, upland pastures, and old abandoned orchards; also occurs along wooded lakeshores and streams.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Icterus galbula	**Baltimore Oriole**				**RED**	**Arrive in the northern states and Canada in April-May; males precede females by a few days. Southward migration begins in late July or early August. Habitat includes open woodland, deciduous forest edge, riparian woodland, partly open situations with scattered trees, orchards, and groves of shade trees. In migration and winter this oriole also occurs in humid forest edge, second growth, and scrub; treetop level in coffee and cacao plantations, and savannah groves.**
Molothrus ater	**Brown-headed Cowbird**				**YELLOW**	**Habitat Comments: Breeding habitat includes woodland, forest (primarily deciduous), forest edge, city parks, suburban gardens, farms, and ranches. Cowbirds often are associated with forest-field edge habitat and clearings in forests. Feedlots, pastures, and fields with livestock also attract cowbirds, especially in predominately forested areas. Permanent resident in NS**
Perisoreus canadensis	**Gray Jay**				**YELLOW**	**Resident form Alaska east to Labrador and south across the northern U.S. Most commonly found in coniferous forests.**
Pheucticus ludovicianus	**Rose-breasted Grosbeak**				**YELLOW**	**Breeds from northeastern B.C. Manitoba, and Nova Scotia to southern Alberta, North Dakota, Oklahoma, and New Jersey, and as far south as Georgia; regular visitor on the west coast and winters from central into northern South America. Preferred habitats include moist woodlands, open fields and old, overgrown orchards.**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Picoides arcticus	Black-backed Woodpecker				YELLOW	Resident in Alaska, Canada, and northern U.S. Preferred habitat includes coniferous forests in the boreal zone, especially where burned, logged, or swampy.
Pinicola enucleator	Pine Grosbeak				RED	Open coniferous (less commonly mixed coniferous-deciduous) forest and forest edge; in migration and winter also in deciduous forest, woodland, second growth and shrubbery. Nests in trees or shrubs in open coniferous woods, 2-9 m above ground Non breeding resident in NS
Poecile hudsonica	Boreal Chickadee				YELLOW	Boreal coniferous and mixed forests, muskeg bogs, vicinity of white cedar and hemlock swamps, birches and streamside willows. Nests in natural cavities or abandoned woodpecker holes, or in cavity dug by pair in rotten tree stub, usually within 1 m of ground. Permanent resident. Breeds from northern Alaska east to Labrador and Newfoundland, south to northern edge of U.S. Occasionally wanders southward during winter. Usually found in coniferous forests.
Euphagus carolinus	Rusty Blackbird	SC	SC		Red	Breed in wet forest and thicket habitats, generally in conifer dominated landscapes. Lake and river shore swamps, streamside thickets beaver ponds, peat lands, and shrubby or forested margins of sedge meadows and marshes are typical habitats. Most likely to be found in the more boreal habitats at higher elevations or coast influenced areas. Breeds from Alaska across northern Canada to southern Canada, northern New York, and northern New England. Preferred habitats include beaver ponds, roadsides, landfills, wet meadows, and

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
						shrubby shorelines.
Regulus calendula	Ruby-crowned Kinglet				YELLOW	Breeds from Alaska east across Canada to Newfoundland, south California and New Mexico, and to the Great Lakes region and southern New England in the east. Spends winters south from southern B.C. and California across the southern tier of the states to southern New England. Preferred habitats include coniferous and deciduous forests.
Regulus satrapa	Golden-crowned Kinglet				YELLOW	Common from southern Alaska to central Canada and southeast to the Carolinas; spends winters south to Florida and the Gulf Coast. Preferred habitat include dense conifer forests; also found in deciduous and mixed forests.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Sialia sialis	**Eastern Bluebird**	**NAR**			**YELLOW**	**Habitat includes forest edge, open woodland, and partly open situations with scattered trees, from coniferous or deciduous forest to riparian woodland, also pine woodland or savannah in the tropics. Breeding Bird- NS- northern portions only - towards Amherst and Pictou-Antigonish counties. Breeds east of the Rockies from southeast Canada to the Gulf of Mexico; winters in southern portion of breeding range. Inhabits open woodlands, clearings, farmlands, parks, orchards, gardens, fields, often seen along roadsides on utility wires and fences.**
Spinus pinus	**Pine Siskin**				**YELLOW**	**Breeds from southern Alaska, Mackenzie, Quebec, and Newfoundland south to California, Arizona, New Mexico, Texas, Great Lakes region, and northern New England; wanders southward throughout the U.S. during winter. Preferred habitats include coniferous and deciduous forests, woodlands, parks, alder thickets, and brushy pastures.**
Tachycineta bicolor	Tree Swallow				YELLOW	Breeds from Alaska east through northern Manitoba to Newfoundland and south to California, Colorado, Nebraska, and Maryland. Spends winters north to southern California, the Gulf Coast, and the Carolinas. Preferred habitats include open areas near water, such as fields, marshes, meadows, shorelines, beaver ponds, and wooded swamps and standing dead trees.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Tyrannus tyrannus	Eastern Kingbird				YELLOW	Breeds from British Columbia across interior Canada to Maritime Provinces and south to Northern California, central Texas, the Gulf coast, and Florida. Spends winters in the tropics. Inhabits open woodlands, clearings, rural roadsides, farms, orchards, edges of fields, streams, and suburbs.
Vermivora peregrina	Tennessee Warbler				YELLOW	Breeds from Yukon, Manitoba, and Labrador south to B.C., Wisconsin, southern Ontario, and Maine. Spends winters in the tropics. Preferred habitats include open mixed woodlands in the breeding season; trees and bushes during migration.
Wilsonia canadensis	Canada Warbler	T	T		RED	Found throughout the Maritimes- breeds in a variety of forest types- always in areas with a well-developed shrub layer and frequently in moist to wet sites. Forested swamps with some combination of white cedar, black spruce, red maple, and tamarack and dense mixed forests on steep river valley slopes are favoured habitat.
Wilsonia pusilla	Wilson's Warbler				YELLOW	Breeds from Alaska eastward to Newfoundland and south to southern California, New Mexico, central Ontario, and Nova Scotia. Spends winters in the tropics. Preferred habitats include moist thickets in woodlands and along streams as well as alder, willow thickets, and bogs.

Appendix III. AVIAN STUDIES

Celtic Current LP

Baseline Avian Use Assessment

Mulgrave Community Wind Power Project

McCallum Environmental Ltd.
June 3, 2013

Contents

List of Appendices

Site Description

A baseline avian use assessment was conducted from Spring 2012 to Winter 2013 as part of baseline environmental assessment requirements for a proposed Community Feed-In Tariff wind power project consisting of three turbines (1-2.3MW and 2-50kW) located on the outskirts of the Town of Mulgrave, Guysborough County, Nova Scotia. The methodology for the annual baseline bird surveys has been developed based on the Environment Canada Canadian Wildlife Service (CWS) documents titled Wind Turbines and Birds: A Guidance Document for Environmental Assessment April 2007 and Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds April 2007.

The proposed Mulgrave Community Feed-In Tariff (COMFIT) Wind Power Project ("Project") is located on the south side of Highway 344 straddling the Town of Mulgrave town limits in Guysborough County, Nova Scotia. The Project is defined by PID 35124452 with a total size of 45 hectares. The northeast end of the project area is bordered by a proposed quarry development along Highway 344, while the southwest end of the project area is bordered by the Old Mulgrave Road. A MET tower exists at the approximate centre of the property, which is referenced as UTM NAD83 622057m E, 5053081m N (Zone 20 T). This is the location for the proposed 2.3 MW Enercon E-92 turbine.

The Project area ranges in elevation from 70 m to 120 m above sea level and consist of a one primary northeastern facing slope. One main forestry access road extends through the property, providing access for timber harvesting, as well as a MET tower, which is located near one of the proposed turbine locations.

The baseline assessment was completed in 2012/2013 by David Johnston for Celtic Current (See Appendix D for the original Avian Field Study report). McCallum Environmental Ltd. has since been commissioned by Celtic Current to continue baseline environmental assessments and preparation of the environmental assessment registration document. This report provides additional quantitative analysis of the data collected by David for Celtic Current from May 15 2012 through January 12, 2013.

Additional surveys for spring migration have been conducted in May of 2013, in order to assess usage of the Project area by early migrants. Additional surveys are also being conducted after consultation with NSDNR in March 2013 to determine potential usage of the Project area during adverse weather conditions. Analysis of data collected during these additional surveys is ongoing.

Habitat

Adjacent land use is a mixture of industrial, residential and undeveloped. The centre of the Town of Mulgrave lies approximately 3km east/southeast of the Project area, while the western Mulgrave Town Limits intersect PID 35124452 and run through the Project Area (See Figure 1, Appendix A). The existing water treatment facility for the Town of Mulgrave is located on the Old Mulgrave Road, approximately 0.8 km southeast of the Project area. Several aggregate quarries exist to the northeast of the Project area including one large industrial aggregate quarry on Porcupine Mountain (1km northeast of the Project area), which is currently operated by Martin Marietta Materials Inc.

The project area consists of a mixture of clear-cut forestry operations and young hardwood stands, with patches of old field, mature deciduous trees and a treed bog. Several mapped watercourses are identified within the project area. Morrison's Lake is the closest water body, located approximately 600m to 1 km

northeast of the proposed turbine locations. Grant Lake is located approximately 1.2 km southwest of the proposed turbine locations. There are no rare or unique habitat types within the Project area. Figure 1 attached to this report show the location of the project area and mapped habitat types (Appendix A).

Site Sensitivity and Level of Concern

Based on the document *Wind Turbine and Birds: A Guidance Document for Environmental Assessment (April 2007)* (CWS, 2007-b), facility size and site sensitivity combine to determine the Level of Concern. The Mulgrave COMFIT Wind Power Project area is located approximately 28 km east of the nearest Important Bird Area (NS009, Pomquet Beach Region, IBA, 2012). While the Project area itself does not contain any landforms that are likely to concentrate bird activity, it is located 2.2 km southwest of the Strait of Canso, which is a known migratory flyway, particularly for migrating sea ducks. Porcupine Mountain is a prominent landscape feature which lies between the Project area and the Strait of Canso, which appears, based on baseline surveys, to be reducing the usage of the Project area by passing migrants.

Based on MBBA data and results from surveys conducted in 2012, the site is used by several species of conservation concern, but is not believed to be regionally or locally important to birds. A priority list of species was compiled to identify potential species of conservation concern and Species at Risk which may be using the Project area and surrounding lands. The priority list of species is included in Appendix B. A review of Atlantic Canada Conservation Data Centre findings confirms the presence of several priority species in and around the Project area (ACCDC report included in Appendix C). A summary of federally and provincially protected species identified within 20km of the Project area (along with preferred nesting habitat) is listed below. Breeding status as documented in the Maritime Breed Bird Atlas square summary (square 20PR25) is also included. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well. Those species actually observed within the Project area during the baseline assessment are identified below as well.

- Common Nighthawk – NS Threatened, COSEWIC & SARA Threatened
  - Nests in gravelly substrates, and even on rooftops
  - MBBA – confirmed breeder
- Canada Warbler – COSEWIC & SARA Threatened
  - Nests in cool, moist woodlands in a nest of dried leaves, often at the base of a stump
  - MBBA – probable breeder
- Olive-sided Flycatcher – COSEWIC & SARA Threatened
  - Softwood forests, near openings such as burns, ponds, and bogs
  - MBBA – observed, possible breeder
  - Observed within the Project area during baseline surveys
- Rusty Blackbird - COSEWIC & SARA Special Concern
  - Prefers beaver ponds, roadsides, landfills, wet meadows and shrubby shorelines
  - MBBA – observed only during first atlas survey, no breeding evidence noted
- Piping Plover – NS, SARA & COSEWIC Endangered
  - Nearly always found in open sandy areas near water.
  - MBBA – not observed
- Bobolink – COSEWIC & SARA Threatened

  - Preferred habitats include prairies and meadows; and marshes during migration
  - MBBA – observed, no breeding evidence noted
- Barn Swallow – COSEWIC Threatened
  - Preferred habitats include agricultural lands, marshes, suburban areas and lakeshores
  - MBBA – observed, possible breeder
- Eastern Wood Pewee – COSEWIC Special Concern
  - Preferred habitats include orchards, parks, roadsides and suburban areas
  - MBBA – Observed, probable breeder
  - Observed within the Project area during baseline surveys

These species of conservation concern have been identified within 20km of the project area as recorded by the ACCDC. This data, supplemented by observations recorded within MBBA atlas square 20PR25 and those identified within the Project area during baseline assessments, confirm the presence of species of conservation concern. As such, the site sensitivity for the Mulgrave COMFIT Wind Power Project is designated as "Very High". The facility size is small (1 to 10 turbines), thus the Level of Concern is Category 4. Category 4 projects require one calendar year of relatively comprehensive baseline surveys.

Methodology

CWS recommends that 20 Point Counts per major habitat type be surveyed during the breeding season. These should be at least 250m apart in a forested landscape, and 500m apart in a cleared landscape. Given the small size of the Project area (45 hectares), it is neither possible nor necessary to follow these recommendations. Instead, 9 Point Count locations have been established which are representative of the habitat available within and directly adjacent to the Project area. Point Counts completed off-site (adjacent property owned by the Proponent) act as control points. Point Count locations ranged from 110-250 m apart, and care was taken to avoid double counting. In addition to Point Counts, a transect was established between Point Count locations to serve as a standardized area search as the surveyor moved from one Point Count location to another. The total length of the transect is approximately 1.3km. Given that the surveyor detected birds within 100m on either side of the transect, the total area searched along the transect is approximately 25.7 hectares. Figure 2 in Appendix A shows the locations of all Point Count locations and transect location.

Point Count and transect surveys were completed early in the morning (1/2 hour prior to sunrise to 4 hours after sunrise). At least one survey per season was conducted in the evening hours, in an effort to identify nocturnal species. All birds seen or heard were recorded, with an estimation of the actual distance to the bird (0-50m, 50-100m and 100m+). As recommended by CWS methodology, (EC, 2006a), surveys were not completed on very windy or rainy days. Point Count surveys were 10 minutes long, while the transect survey was approximately 3 hours long.

General observations including the temperature, visibility, wind speed, presence/absence of fog, date, start and end time of each Point Count survey were recorded. Weather data was collected based on surveyor observation and from data provided from the Environment Canada weather centre, using the Tracadie weather station, which is located approximately 20km west of the Project area.

Birds identified as flyovers were documented, along with all evidence of breeding. Audio playback of selected bird calls and/or mobbing calls were sometimes used to help confirm a species that had been inadequately identified during the ten minute Point Count timeframe.

Four distinct periods of study were used for the baseline assessment of avian usage within the Project area. Methodologies were identified by David Johnston in consultation with EC/CWS. Spring surveys commenced in May 2012:

1. Spring Migration (May): two surveys weekly*
2. Breeding Season (June through August): one survey weekly
3. Fall migration (September through October): two surveys weekly
4. Winter (November through January): one survey monthly.

*Spring migration monitoring commenced on May 15, 2012. Additional surveys have been completed to assess for early migrants through April and May of 2013. Analysis of data collected during 2013 additional surveys is currently ongoing.

The same survey methods and locations were planned for all seasonal monitoring. However, based on a decrease in bird detections during Point Count surveys through August, it was determined that transect surveys alone would be sufficient to identify fall migrants. This methodology was carried through winter surveys as well. The standardized transect route was still used to provide coverage of the same locations.

Data was collected through a combination of Point Counts and standardized transects in order to provide repeatable surveys for comparison once the turbine has been erected. Quantitative evaluation of all collected data has been completed to provide baseline information regarding the bird community in the Project Area and the specific usage of the Project area by birds across four seasons of data collection.

Quantitative evaluation included analyses of species abundance based on survey date and season. A correlation analysis was performed to determine the effect of average temperature and wind speed on bird detections. Species observed were classified based on functional bird groups (landbirds, raptors, shorebirds, waterbirds, waterfowl and owls) in order to provide an understanding of overall usage of the Project area by major bird groups.

Seasonal trends were analyzed by ranking species abundance over each seasonal monitoring period, to understand which species are most abundant during migration, breeding and overwintering. The usage of the airspace above the Project area was assessed by describing seasonal abundance of those individuals identified as 'flyovers' during baseline assessments. Furthermore, species abundance and diversity were ranked based on Point Count location in order to identify any effect of habitat on diversity or abundance within the Project area. Finally, the observations of Species at Risk and Species of Conservation concern were summarized, and described along with their habitat requirements, to determine the extent to which these species rely on habitat provided within the Project area, and the assess the risks posed to these species by the proposed development.

Results & Discussion

Table 1 (Appendix A) provides a list of all site visits and relevant weather data along with the total number of birds identified per day. Correlation analyses were conducted to determine the effect of temperature and wind speed on bird detections. While there was a slight positive relationship between temperature and bird detections (more birds were detected on warmer days) and a slight negative relationship between wind speed and bird detections (fewer birds were detected on windier days), these relationships were not statistically significant (R^2=0.0689 and R2=0.1075, respectively).

In total, 2238 individual birds, representing 60 species were identified within the Project area. The average survey length was 3 hours long, for a total of 75.25 hours of survey time. As indicated in methodology, the survey time consisted of a combination of Point Count and transect surveys. A list of species observed, along with their species codes, conservation status, seasonal, and total abundance is provided in Table 2, and is presented graphically in Figure 3 (Appendix A). Species at Risk and species of conservation concern are identified in Table 2, and details of their conservation status are presented in Table 3.

Bird species were identified based on functional bird groups to understand how each group of birds is using the Project area. These functional groups include landbirds, waterfowl, waterbirds, raptors, shorebirds, and owls. The most abundant group observed on site is landbirds, which account for 75% of all species, and 95% of all individuals, as shown in Figure 4 (Appendix A).

Spring migration

During spring migration, 535 individuals representing 42 species were observed through a series of five site visits, conducted between May 15 and May 29, 2012. The most abundant species were Ovenbirds, White-throated Sparrow and Magnolia Warblers. Abundance of species observed in spring migration is shown in Figure 5, and is shown relative to other seasons in Figure 3 (Appendix A).

Based on the lack of diverse habitats available within, the Project area does not offer many obvious attractants to passing migrants. Despite this, several obvious migrants were observed during spring. Obvious migrants were primarily solitary, and were not observed in long flight paths or flocks, with the exception of a flock of 24 Blue Jays observed on May 15, 2012. No obvious concentration of sea ducks or shorebirds were observed.

Breeding season

Ten site surveys were conducted during the summer breeding period and early fall migration, between June 1 and August 31, 2012. A total of 842 individuals representing 47 species were observed during the breeding season; the most abundant of which were Red-eyed Vireo, White-throated Sparrow and American Robin.

Throughout the summer breeding season, observations of breeding evidence were recorded as described by the Maritime Breeding Bird Atlas breeding evidence coding sheet (MBBA, 2013). This coding sheet identifies possible, probable and confirmed breeders based on behavioral observations. With the consistent level of survey effort over an extended period of time within the breeding season, it was possible to establish permanent breeding territory or higher evidence for several species. Table 4 (Appendix A) outlines breeding evidence and breeding status of all species for which breeding evidence was observed.

Since the site surveyed is a relatively small part of the surrounding area, however, it is not possible to confirm that all species listed were actually nesting within the boundaries of the site. For instance, for a bird that was

observed carrying food (confirmed breeding evidence), it is possible that the bird was nesting on an adjacent parcel of land.

All of the species identified with high breeding evidence are native species expected to be found in this area of Nova Scotia and the province in general, and within the typical and common habitat associated with the Project and surrounding landscape. Abundance of species observed in the summer breeding season is shown in Figure 6, and is shown relative to other seasons in Figure 3 (Appendix A).

Fall migration

During the fall migration surveys, only transect surveys were completed. This decision was made based on the decrease in species and abundance of birds observed during Point Count surveys through August. The total average survey time (Point Counts and transects combined) was slightly higher during spring and summer monitoring (average survey time was 208 minutes per day in spring and summer, compared with 147 minutes per day during fall migration). This must be considered when making direct comparisons of seasonal species abundance. During fall migration, a total of 153 individuals were observed, representing 33 species. The most abundant species observed were the Black-capped Chickadee, Dark-eyed Junco, and American Robin. Abundance of species observed during fall migration is shown in Figure 7, and is shown relative to other seasons in Figure 3 (Appendix A).

As previously noted in the section about spring migration, the lack of diverse habitat within the Project area does not offer obvious attractions to passing migrants for stopover or foraging. The unknown duck species observed as flyovers late in the summer breeding season were likely early migrants.

Winter

One visit was made per month during the winter season, in November, December, and January. A total of 32 individuals representing 7 species were observed during the transect surveys. The most abundance species observed were the Black-capped Chickadee, American Crow, and Herring Gull. This site does not support a diverse or abundant community of winter resident species. Abundance of species observed during fall migration is shown in Figure 8, and is shown relative to other seasons in Figure 3 (Appendix A).

Flyovers

In this study, flight height was not recorded, so no direct conclusions can be made as it relates to risks posed to birds flying at turbine height. Instead, birds identified as flyovers are being assessed to determine the level of passing migrants. Birds observed as flyovers during all Point Counts and transect surveys were recorded as such, to provide an indication of the usage of this airspace by passing migrants.

Overall, flyovers account for approximately 5% of all individuals observed within the Project area (N=121). Flyovers were most abundant during the fall migration (11%, N=29). The most abundant species observed flyover during fall migration was the American Crow (N=16). Approximately 6% of birds observed during the summer breeding season were identified as flyovers (N=60). It is important to note that through the end of August, so it is likely that some birds identified as flyovers during the breeding season are early migrants. This is particularly true of the unknown duck species, which was identified as the most abundant summer flyover (N=39). During spring migration, 4% of birds observed were identified as flyovers (N=31), the most abundant species being the Blue Jay (N=24).

Ducks and Common Loons were observed as occasional flyovers throughout the survey. There are a number of lakes in the vicinity of the Project area, including Grant Lake and Morrison's Lake, both of which likely provide habitat for ducks and loons. However, these birds were not seen regularly or even occasionally within the project area, suggesting the project area is not a supporting habitat for ducks and common loons who might be present in closer proximity to the lakes. Occasionally, Double-crested Cormorants, Great-blue Herons and Herring Gulls were identified as flyovers.

Other species commonly noted as flyovers include raptors such as Sharp-shinned Hawks and a single Merlin. Bald Eagles and Red-tailed Hawks were occasionally observed in the vicinity of Morrison's Lake, but less frequently within the Project area.

Landbirds such as the Common Raven, American Crow and various species of woodpeckers were frequently observed as flyovers. A single flock of 30 unknown ducks observed during the summer breeding season was the largest flock of birds observed during the entire baseline assessment, followed by a single flock of 24 Blue Jays, observed during spring migration.

While it is known that the nearby Strait of Canso is used as a flyway and staging ground by migratory seabirds, the Project area itself does not serve as a flyway. Porcupine Mountain lies between the Strait of Canso and the Project area, which may be acting as a barrier to passing migrants which are attracted to the Strait of Canso. The project area does not support interesting habitat for birds during migration (lack of extensive wetland and surface water systems, no open water lakes or ponds) and little mature growth forest stands, and significant anthropogenic influence. Furthermore, surrounding properties continue to reduce the quality of the habitat with three active quarries, road and highway development, residential and industrial developments present surrounding the Project Area on three sides within 200-500 m.

Effect of Habitat type

Point Count locations and the transect survey route have been designed to collect information about bird usage from the variety of habitat types present within the Project area. The Project area does not provide a diversity of habitat types, so the majority of Point Count locations (and the transect survey route which connects them) are located within scrubby young deciduous re-growth. The exceptions to this are Point Count 7, which is located near a mature hardwood stand, and Point Count 9 which is located within a clear-cut with softwood re-growth near a treed swamp just to the north of the project area. Point Counts 7 and 9 are also in close proximity (just northeast) to a treed bog identified from the NSDNR Wetland inventory.

On average, 100.87 individuals, representing 24.87 species were observed at each Point Count location during spring migration and summer breeding season surveys. The highest diversity and abundance of species was observed at Point Count 5 (cleared area with young re-growth), with 150 individuals representing 32 species. Point Count 7 (mature hardwood) showed the lowest diversity and abundance, with 74 individuals and 19 species. Table 5 presents a summary of diversity and abundance of birds observed at each Point Count location, while the abundance of each species observed at each Point Count location is presented in Figures 9 through 17, in Appendix A.

Species at Risk and Species of Conservation Concern

One Species at Risk (SAR) and seven species of conservation concern (SCC) were identified within the Project area during the baseline avian use assessment. A Species at Risk is one which is legally protected under the

federal Species at Risk Act (SARA) or the provincial Nova Scotia Endangered Species Act (NSESA), while a species of conservation concern is one which is listed by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC) or one which is classified as red or yellow by the Nova Scotia Department of Natural Resources (NSDNR) general status of wild species (Province of Nova Scotia, 2011). The species observed include:

- Boreal Chickadee (SCC);
- Common Loon (SCC);
- Eastern Wood Pewee (SCC);
- Golden-crowned Kinglet (SCC);
- Gray Jay (SCC);
- Killdeer (SCC);
- Olive-sided Flycatcher (SAR); and
- Ruby-crowned Kinglet (SCC).

For a summary of the conservation status and seasonal abundance of these species, see Table 3, in Appendix A.

The Boreal Chickadee, Golden-crowned Kinglet, Gray Jay, Killdeer and Ruby-crowned Kinglet are listed as 'yellow' under NSDNR's general status ranks. These species have been flagged as 'early watch' species by the Province, but they are not currently protected by the NSESA (Province of Nova Scotia, 2011). As some of these species are potentially in decline, they will remain priority species for all future monitoring within the Project area. The most abundant of the 'yellow' listed species is the Ruby Crowned Kinglet, with a total of ten individuals observed during all baseline surveys. These species are fairly common in coniferous and deciduous forests throughout Nova Scotia. The Project area does not offer any rare or unique habitat types upon which these species rely.

The Eastern Wood Pewee is listed as 'yellow' under NSDNR's general status ranks, and is listed as a 'species of concern' by COSEWIC. This species is one of the most common and widespread songbirds associated with North America's eastern forests. While the species is apparently resilient to many kinds of habitat changes, like most other long-distance migrants that specialize on a diet of flying insects, it has experienced persistent declines over the past 40 years both in Canada and the United States. A single Eastern Wood Pewee was observed on two occasions during the summer breeding (potentially the same individual), but no breeding evidence was observed (Government of Canada, 2012a).

The Common Loon is classified as 'red' under NSDNR's general status ranks. It is not currently protected under the NSESA, SARA, or listed by COSEWIC. In total, 34 individuals were observed through the spring, summer and fall surveys. They are most susceptible to activity in and around lakes (for example, boating and shoreline development), so construction of turbines is not likely to impact their breeding habitat, particularly within this Project area, as it has no water bodies. Loons were commonly observed as flyovers, likely moving over the Project area to either Grant Lake or Morrison's Lake which is assumed to be their primary habitat. Loons are most susceptible to activity in and around lakes (for example, boating and shoreline development), so construction of turbines is not likely to directly impact their breeding habitat. Of the 34 Loon detections during baseline assessments, 33 were heard at a distance greater than 100m from the observer, while a single loon

was observed as a flyover. As such the construction of a single turbine is not expected to pose a significant risk to Common Loons as they pass over the Project area.

The Olive-sided Flycatcher was identified during this breeding bird survey and is listed by COSEWIC and SARA as 'Threatened'. Provincially, it is identified as red (at risk) by DNR, but it is not protected under the NSESA. In total, 9 individuals were observed late in the breeding season within the Project area. These observations included fledged young, however it is not expected that the Olive-sided Flycatcher uses the Project area for breeding, as it was not observed within the Project area during June and July, when the species is typically nesting. Instead, it is believed that the Olive-sided Flycatcher was breeding nearby, and was observed during a migration stopover during early fall migration.

Olive-sided Flycatchers are listed as threatened in SARA and COSEWIC as a result of continuous and considerable declines in the population. Not much is known about the cause of this decline. Much of this decline is attributed to large scale changes in North American breeding habitat, as well as loss of habitat in their wintering grounds of Panama, Venezuela and Bolivia (Government of Canada, 2012b). In the North American breeding grounds, Olive-sided Flycatchers are most often associated with openings or edges in coniferous forests, especially those with tall treed or snags for perching. Bog margins, river valleys and slow-moving streams are all frequently used feeding habitats. The occurrence of Olive-sided Flycatchers in the Project area is not surprising, considering they are commonly found in commercially harvested forests throughout Nova Scotia during all bird work associated with development projects and environmental assessment baseline work.

The Common Nighthawk is currently listed as Threatened by SARA, COSEWIC, and the NSESA. According to the ACCDC, the Common Nighthawk has been observed within 3km of the Project area, and it is identified as a confirmed breeder in the Maritime Breeding Bird Atlas (Square 20PR25). Unlike many songbirds which are most vocal during the early morning hours, the Common Nighthawk is most easily observed in flight during dawn and dusk as they forage for insects over open woodlands. Three evening surveys were completed within the Project area (one each in May, June and July, when detection of Nighthawks is most likely). No Common Nighthawks were observed during the baseline assessments. The Common Nighthawk will remain a priority species for all future monitoring within the Project area.

Conclusion

Avian usage of the Project area was found to contain species consistent with expectations based on habitat and location. The site does not support a large abundance or diversity of species, and does not appear to be used by migrating sea ducks or seabirds which are known to move through the Strait of Canso. A small influx of migrating birds was evident in both the spring and fall monitoring, and there was evidence of a considerable number of native species using the Project area for nesting and breeding activities. The site does not support a significant number of overwintering birds.

The species with highest conservation concern observed during baseline assessments are the Olive-sided Flycatcher and the Eastern Wood Pewee. Both of these species were determined to be using the site while preparing for fall migration. These species observed may be in decline, and therefore should be monitored carefully throughout all phases of assessment, construction, operation and decommissioning. Pre-construction

nest searches, as required by the Migratory Birds Convention Act will be imperative to prevent impact on all breeding birds, particularly sensitive ones such as the Olive-sided Flycatcher.

The species observed during baseline assessments are consistent with expectations of forested elevated sites throughout Nova Scotia. The Project area provides nesting habitat for an assemblage of native, common species. The project area does not provide rare or unique habitat types, and does not provide unique or critical habitat for Species at Risk, species of conservation concern or colonial species.

References

Environment Canada, CWS. April 2007-a. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds.

Environment Canada, CWS. April 2007-b. Wind Turbines and Birds: A Guidance Document for Environmental Assessment.

Government of Canada. 2012a. Species at Risk Public Registry: Eastern Wood Pewee. http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1198

Government of Canada. 2012b. Species at Risk Public Registry: Olive-sided Flycatcher. http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=999

IBA. 2012. Important Bird Area NS009: Pomquet Beach Region. http://www.ibacanada.ca/site.jsp?siteID=NS009&lang=EN

Maritime Breeding Bird Atlas. 2013. Breeding Evidence Coding Sheet. http://www.mba-aom.ca/english/index.html

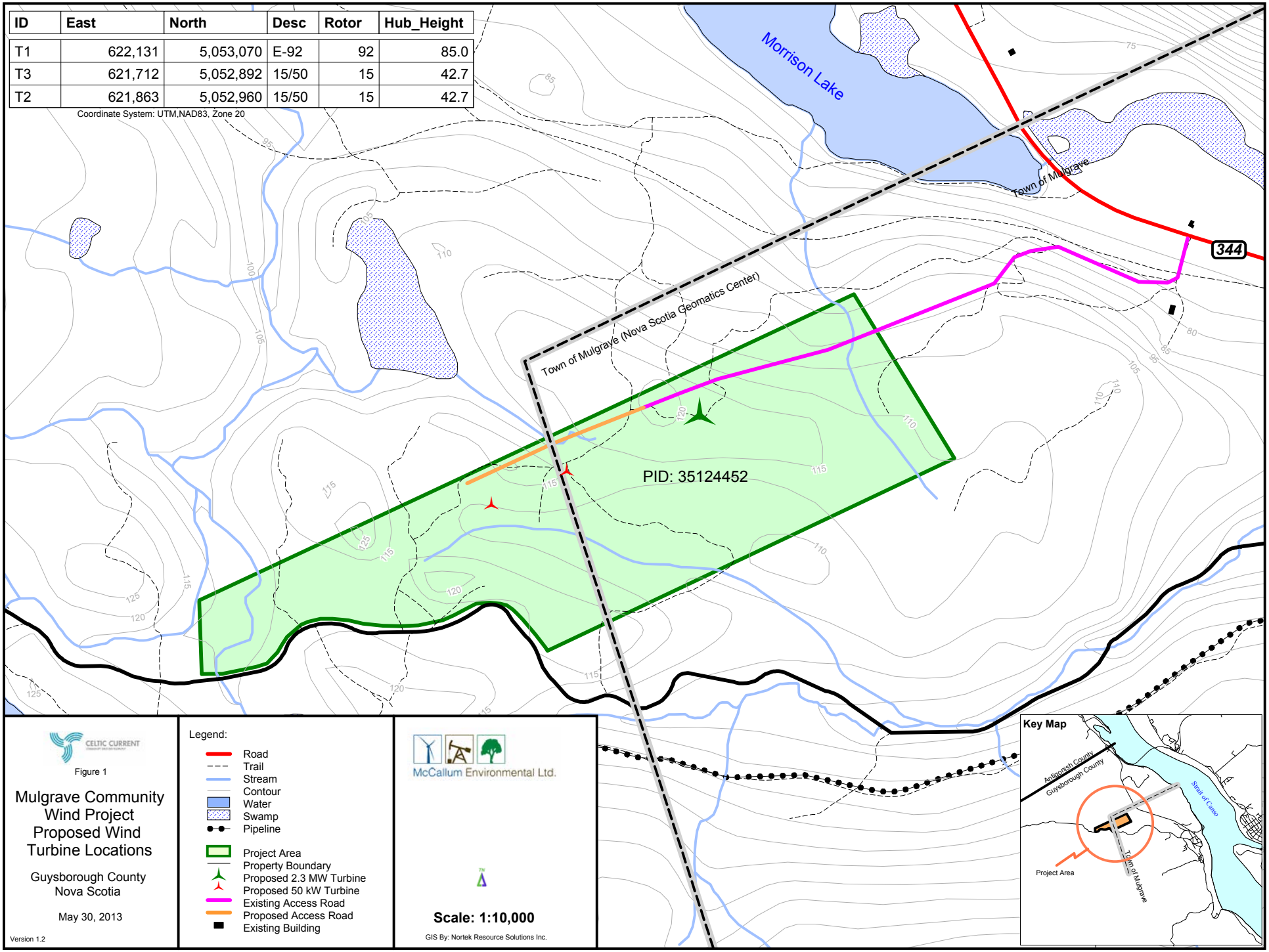
Nova Scotia Environment. September 2008. Guide to Addressing Wildlife Species and Habitat in an EA Registration Document.

Province of Nova Scotia, 2011. General Status Ranks of Wild Species. http://www.gov.ns.ca/natr/wildlife/genstatus/

Appendix A: Figures and Tables

ID	East	North	Desc	Rotor	Hub_Height
T1	622,131	5,053,070	E-92	92	85.0
T3	621,712	5,052,892	15/50	15	42.7
T2	621,863	5,052,960	15/50	15	42.7

Coordinate System: UTM,NAD83, Zone 20



CELTIC CURRENT

Figure 1

Mulgrave Community Wind Project Proposed Wind Turbine Locations

Guysborough County
Nova Scotia

May 30, 2013

Version 1.2

Legend:

- Road
- Trail
- Stream
- Contour
- Water
- Swamp
- Pipeline
- Project Area
- Property Boundary
- Proposed 2.3 MW Turbine
- Proposed 50 kW Turbine
- Existing Access Road
- Proposed Access Road
- Existing Building

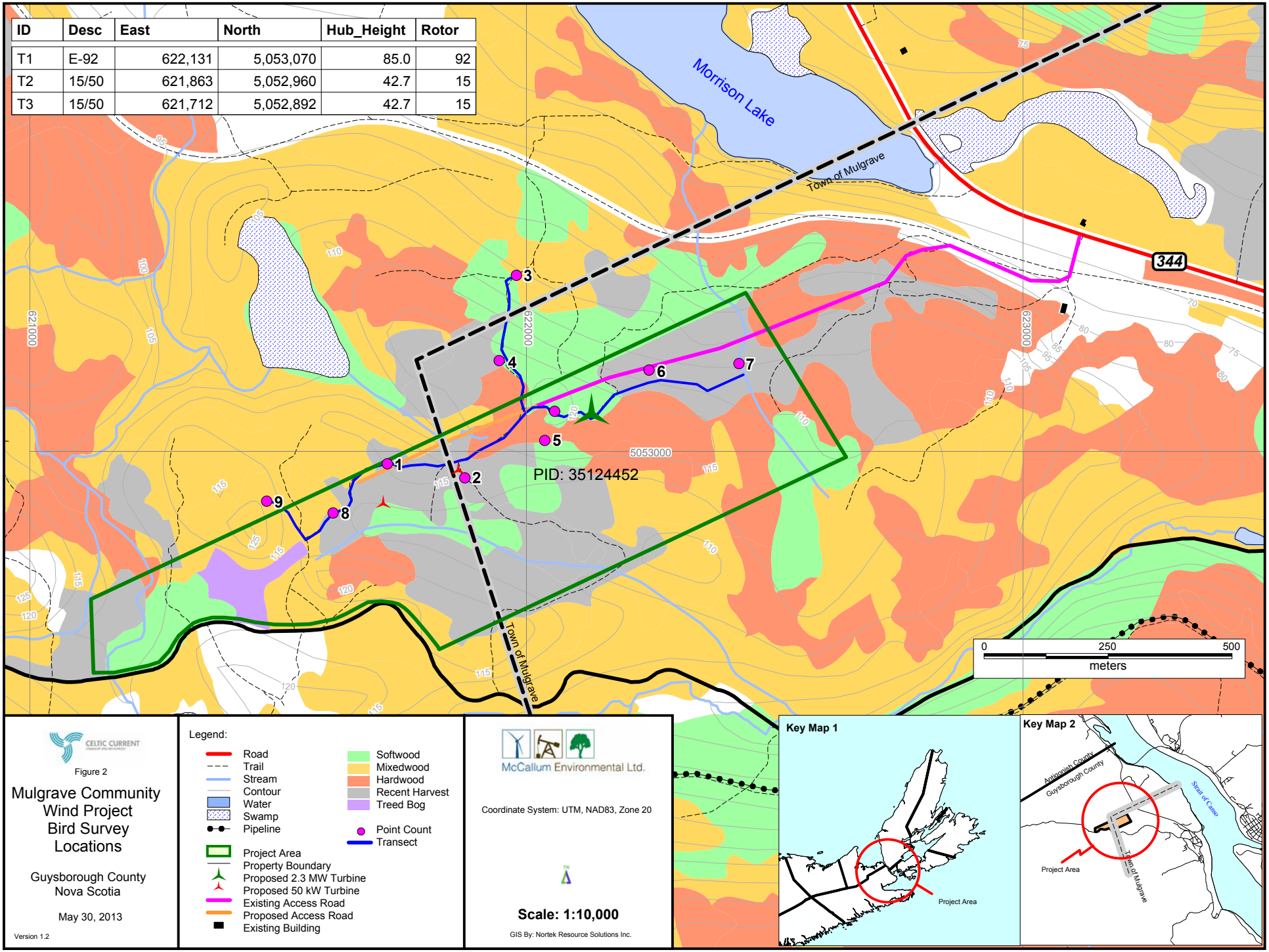
McCallum Environmental Ltd.

Scale: 1:10,000

GIS By: Nortek Resource Solutions Inc.

Key Map

ID	Desc	East	North	Hub_Height	Rotor
T1	E-92	622,131	5,053,070	85.0	92
T2	15/50	621,863	5,052,960	42.7	15
T3	15/50	621,712	5,052,892	42.7	15



CELTIC CURRENT

Figure 2

Mulgrave Community Wind Project Bird Survey Locations

Guysborough County
Nova Scotia

May 30, 2013

Version 1.2

Legend:

- Road
- Trail
- Stream
- Contour
- Water
- Swamp
- Pipeline
- Project Area
- Property Boundary
- Proposed 2.3 MW Turbine
- Proposed 50 kW Turbine
- Existing Access Road
- Proposed Access Road
- Existing Building
- Softwood
- Mixedwood
- Hardwood
- Recent Harvest
- Treed Bog
- Point Count
- Transect

McCallum Environmental Ltd.

Coordinate System: UTM, NAD83, Zone 20

Scale: 1:10,000

GIS By: Nortek Resource Solutions Inc.

Table 1. Summary of survey times and weather conditions

Date	Time	Length of Survey (mins)	Average Temp. ºC	Wind Direction (10º)	Wind Speed (km/hr)	Weather	# of birds observed per day
15-May-12	6:00a.m. - 9:30a.m.	210	16	20° – 23°	22	Partly sunny	177
18-May-12	6:15a.m. – 10:00a.m.	235	10	26° – 28°	15.5	Sunny	157
21-May-12	5:00p.m. - 8:15p.m.	195	23.5	22° – 21°	21.5	Sunny, breezy	108
25-May-12	5:45a.m. - 9:30a.m.	235	10.5	3° – 19°	9.5	Sunny, light cloud	197
29-May-12	5:45a.m. - 9:15a.m.	210	6	7° – 6°	7.5	70% cloud	127
1-Jun-12	5:45a.m. – 9:00a.m.	205	9.5	27° –32°	13.5	Cloudy, light drizzle	153
12-Jun-12	5:45a.m. – 9:00a.m.	205	12	5° – 12°	6.5	Fog, clearing, part sun	149
18-Jun-12	5:15p.m. - 8:30p.m.	195	13.5	13° – 15°	10	Sunny, breezy	75
26-Jun-12	5:30a.m. - 9:00a.m.	210	15.5	11° – 13°	14.5	Overcast, fog, breezy	108
3-Jul-12	5:30a.m. - 9:00a.m.	210	18.5	15° – 32°	5	Sunny, warm	174
13-Jul-12	5:30a.m. - 9:15a.m.	235	20	22° – 26°	16	Sunny, warm	151
26-Jul-12	5:30p.m. - 8:45p.m.	195	22.5	28° – 21°	13	Hot and breezy	82
3-Aug-12	5:15a.m. - 9:00a.m.	235	19	21° – 22°	7.5	Partly sunny	138
16-Aug-12	5:45a.m. - 8:45a.m.	180	20	15° – 14°	11	Overcast, slight breeze	98
31-Aug-12	6:00a.m. - 8:45a.m.	165	18.5	19° – 22°	31	Partly cloudy, windy	25
5-Sep-12	6:30a.m. - 8:45a.m.	135	14.5	20° – 25°	9	Overcast, then rain	63
13-Sep-12	6:45a.m. – 9:15a.m.	150	16.5	20° – 21°	15	Sunny, calm	62

Date	Time	Length of Survey (mins)	Average Temp. ºC	Wind Direction (10º)	Wind Speed (km/hr)	Weather	# of birds observed per day
19-Sep-12	6:45a.m. – 9:00a.m.	135	18	17° – 17°	29	Partly cloudy, windy	18
26-Sep-12	7:00a.m. - 9:45a.m.	165	15	20° – 22°	21	Partly cloudy, breezy	56
1-Oct-12	12:30p.m. - 3:00p.m.	150	19	20° – 20°	17	Partly cloudy, calm	34
10-Oct-12	7:30a.m. - 10:00a.m.	150	11.5	9° – 10°	15	Partly cloudy	29
19-Oct-12	8:00a.m. - 10:30a.m.	150	12	21° – 21°	8	Sunny, warm, calm	26
19-Nov-12	1:00p.m. – 2:45p.m.	105	4.5	28° – 2°	6.5	Sunny, cool, calm	7
14-Dec-12	8:30a.m. - 10:30a.m	120	-2	21° – 21°	15	Partly cloudy, calm	19
12-Jan-13	8:30a.m. - 10:45a.m	135	-2.5	35° – 36°	20	Partly cloudy, breezy	8

Table 2. Summary of species observed.

Species	Code	SAR*	SCC**	Spring	Breeding	Fall	Winter	Total
Alder Flycatcher	ALFL	-	-	6	19	0	0	25
American Crow	AMCR	-	-	6	20	25	6	57
American Goldfinch	AMGO	-	-	36	71	29	4	140
American Redstart	AMRE	-	-	37	60	0	0	98
American Robin	AMRO	-	-	48	85	12	0	145
American Woodcock	AMWO	-	-	0	4	0	0	4
Barred Owl	BADO	-	-	0	1	0	0	1
Bald Eagle	BAEA	-	-	0	3	0	0	3
Barn Owl	BAOW	-	-	1	0	0	0	1
Black-and-white Warbler	BAWW	-	-	61	40	5	0	106
Black-capped Chickadee	BCCH	-	-	22	35	54	12	123
Belted Kingfisher	BEKI	-	-	1	0	0	0	1
Blue-headed Vireo	BHVI	-	-	20	10	0	0	30
Blackburnian Warbler	BLBW	-	-	0	2	0	0	2
Blue Jay	BLJA	-	-	33	18	12	0	63
Boreal Chickadee	BOCH	-	√	2	0	0	0	2
Black-throated Green Warbler	BTNW	-	-	18	7	3	0	28
Canada Goose	CAGO	-	-	0	0	1	0	1
Cedar Waxwing	CEDW	-	-	0	58	0	0	58
Common Grackle	COGR	-	-	1	0	1	0	2
Common Loon	COLO	-	√	10	18	5	0	34
Common Raven	CORA	-	-	1	6	7	0	14
Common Yellow-throat	COYE	-	-	14	30	1	0	45
Double-crested Cormorant	DCCO	-	-	0	2	0	0	2
Dark-eyed Junco	DEJU	-	-	19	50	36	0	105
Downy Woodpecker	DOWO	-	-	0	1	1	0	2
Duck sp.	DUCK sp.	-	-	3	39	0	0	42
Eastern Wood Pewee	EAWP	-	√	0	2	0	0	2

Species	Code	SAR*	SCC**	Spring	Breeding	Fall	Winter	Total
Great Blue Heron	GBHE	-	-	1	2	0	0	3
Golden-crowned Kinglet	GCKI	-	√	2	1	2	2	7
Gray Jay	GRAJ	-	√	0	0	0	1	1
Hairy Woodpecker	HAWO	-	-	0	4	2	1	7
Herring Gull	HERG	-	-	0	14	0	6	20
Hermit Thrush	HETH	-	-	38	52	1	0	91
Killdeer	KILL	-	√	1	0	0	0	1
Least Flycatcher	LEFL	-	-	1	0	0	0	1
Magnolia Warbler	MAWA	-	-	87	78	11	0	176
Merlin	MERL	-	-	1	0	0	0	1
Mourning Warbler	MOWA	-	-	2	17	3	0	22
Nashville Warbler	NAWA	-	-	1	0	0	0	1
Northern Flicker	NOFL	-	-	16	11	7	0	34
Northern Parula	NOPA	-	-	7	10	0	0	17
Northern Waterthrush	NOWA	-	-	11	11	0	0	22
Olive-sided Flycatcher	OSFL	√	√	0	9	0	0	9
Ovenbird	OVEN	-	-	98	59	1	0	158
Palm Warbler	PAWA	-	-	0	0	1	0	1
Pileated Woodpecker	PIWO	-	-	2	3	1	0	6
Purple Finch	PUFI	-	-	15	1	0	0	16
Ruby-crowned Kinglet	RCKI	-	√	5	2	3	0	10
Red-eyed Vireo	REVI	-	-	21	143	15	0	179
Red-tailed Hawk	RTHA	-	-	0	2	0	0	2
Ruby-throated Hummingbird	RTHU	-	-	0	2	0	0	2
Ruffed Grouse	RUGR	-	-	3	3	4	0	10
Song Sparrow	SOSP	-	-	2	0	2	0	4
Sharp-shinned Hawk	SSHA	-	-	0	1	2	0	3
Swainson's Thrush	SWTH	-	-	10	38	1	0	49
Warbler sp.	WARB sp.	-	-	0	0	17	0	17

Species	Code	SAR*	SCC**	Spring	Breeding	Fall	Winter	Total
Woodpecker sp.	WOOD sp.	-	-	6	7	4	0	17
White-throated Sparrow	WTSP	-	-	89	99	16	0	204
Yellow-rumped Warbler	YRWA	-	-	7	2	2	0	11
TOTAL	**60**	**1**	**8**	**765**	**1152**	**287**	**32**	**2238**

*SAR: Species at Risk – includes those species with legal protection under the federal Species at Risk Act (SARA) or the provincial Nova Scotia Endangered Species Act (NSESA).
**SCC: Species of Conservation Concern – includes those species listed by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC) and those listed as yellow or red by Nova Scotia Department of Natural Resources General Status Ranks.

Table 3. Species at Risk and Species of Conservation Concern

Species	SARA	NSESA	COSEWIC	NSDNR	Breeding Status	Season observed*	Total
Boreal Chickadee	-	-	-	Yellow	-	Sp.	2
Common Loon	-	-	-	Red	Possible	Sp., Su., F	34
Eastern Wood Pewee	-	-	Special Concern	Yellow	Possible	Su.	2
Golden-crowned Kinglet	-	-	-	Yellow	Possible	Sp, Su, F, W.	7
Gray Jay	-	-	-	Yellow	-	W	1
Killdeer	-	-	-	Yellow	-	Sp.	1
Olive-sided Flycatcher	Threatened	-	Threatened	Red	Possible	Su.	9
Ruby-crowned Kinglet	-	-	-	Yellow	Possible	Sp., Su., F	10
Total							65

*Sp.: Spring migration, Su.: Summer breeding, F: Fall migration, W: Winter

Table 4. Breeding evidence as observed from June 1 – August 31, 2012.

Species	Breeding Evidence	Breeding Status
Ruffed Grouse	Feeding Young	Confirmed
Red-eyed Vireo	Feeding Young	Confirmed
Hermit Thrush	Carrying Food	Confirmed
American Robin	Carrying Food	Confirmed
Black & White Warbler	Carrying Food	Confirmed
White-throated Sparrow	Carrying Food	Confirmed
American Woodcock	Territory	Probable
Ruby-throated Hummingbird	Territory	Probable
Hairy Woodpecker	Territory	Probable
Northern Flicker	Territory	Probable
Pileated Woodpecker	Territory	Probable
Alder Flycatcher	Territory	Probable
Blue-headed Vireo	Agitated	Probable
Blue Jay	Territory	Probable
Black-capped Chickadee	Territory	Probable
Ruby-crowned Kinglet	Territory	Probable
Swainson's Thrush	Territory	Probable
Cedar Waxwing	Pair	Probable
Northern Parula	Territory	Probable
Magnolia Warbler	Agitated	Probable
Yellow-rumped Warbler	Territory	Probable
Black-throated. Green Warbler	Territory	Probable
American Redstart	Pair	Probable
Ovenbird	Territory	Probable
Northern Waterthrush	Pair	Probable
Morning Warbler	Agitated	Probable
Common Yellowthroat	Territory	Probable

Dark-eyed Junco	Agitated	Probable
Purple Finch	Territory	Probable
American Goldfinch	Territory	Probable
Merlin	Habitat	Possible
Killdeer	Habitat	Possible
Downy Woodpecker	Habitat	Possible
American Crow	Habitat	Possible
Boreal Chickadee	Habitat	Possible
Golden-crowned Kinglet	Habitat	Possible
Nashville Warbler	Singing	Possible
Blackburnian Warbler	Singing	Possible

Table 5. Diversity and abundance of species observed per point count location

Point Count	Diversity	Abundance
1	27	120
2	23	86
3	24	97
4	20	90
5	32	150
6	23	106
7	19	74
8	24	77
9	31	106
Average	24.78	100.67
Minimum	19	74
Maximum	32	150

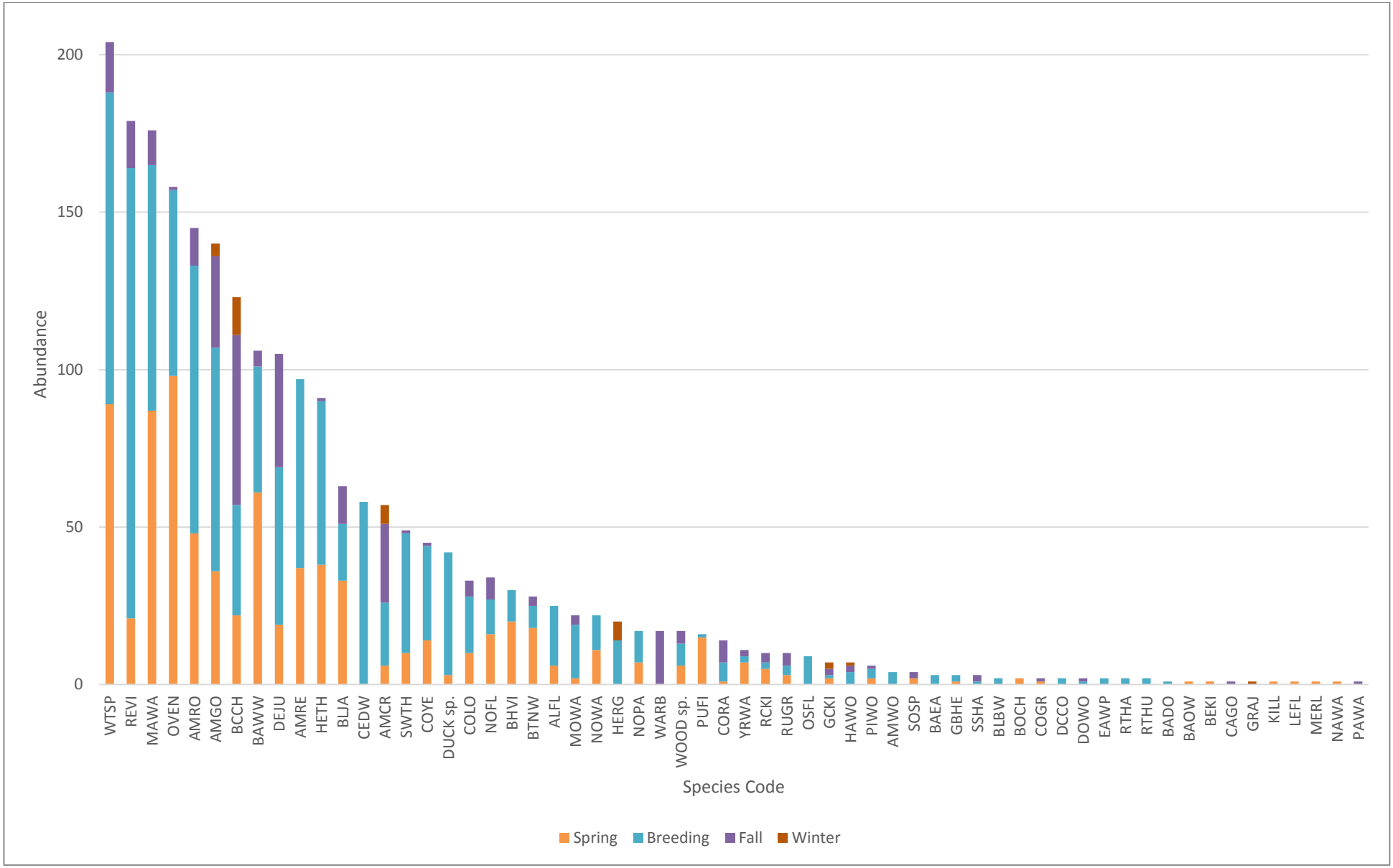


Figure 3. Seasonal and total abundance of bird species. See Table 2 for a list of species codes.

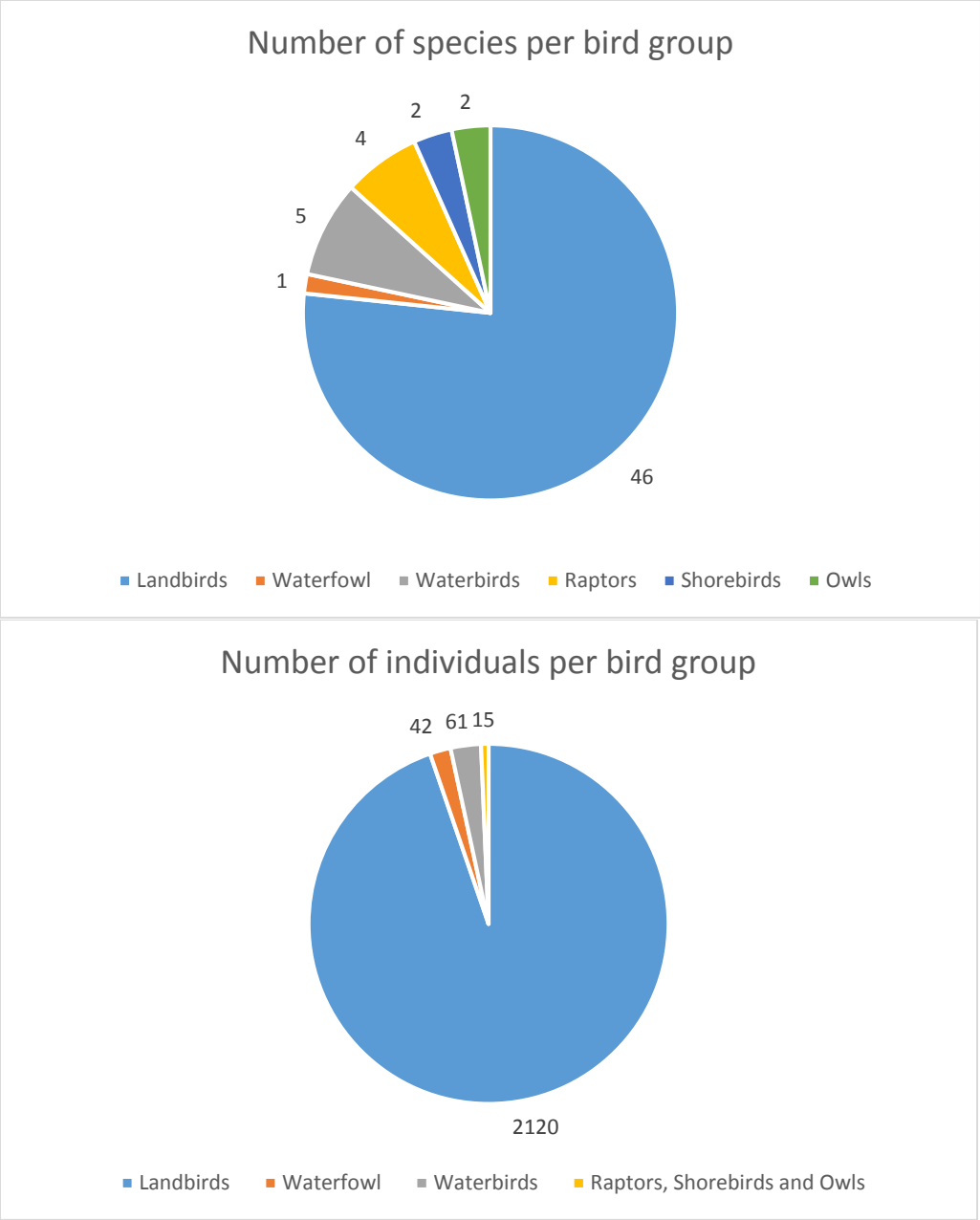


Figure 4. Number of species and number of individuals observed per bird group.

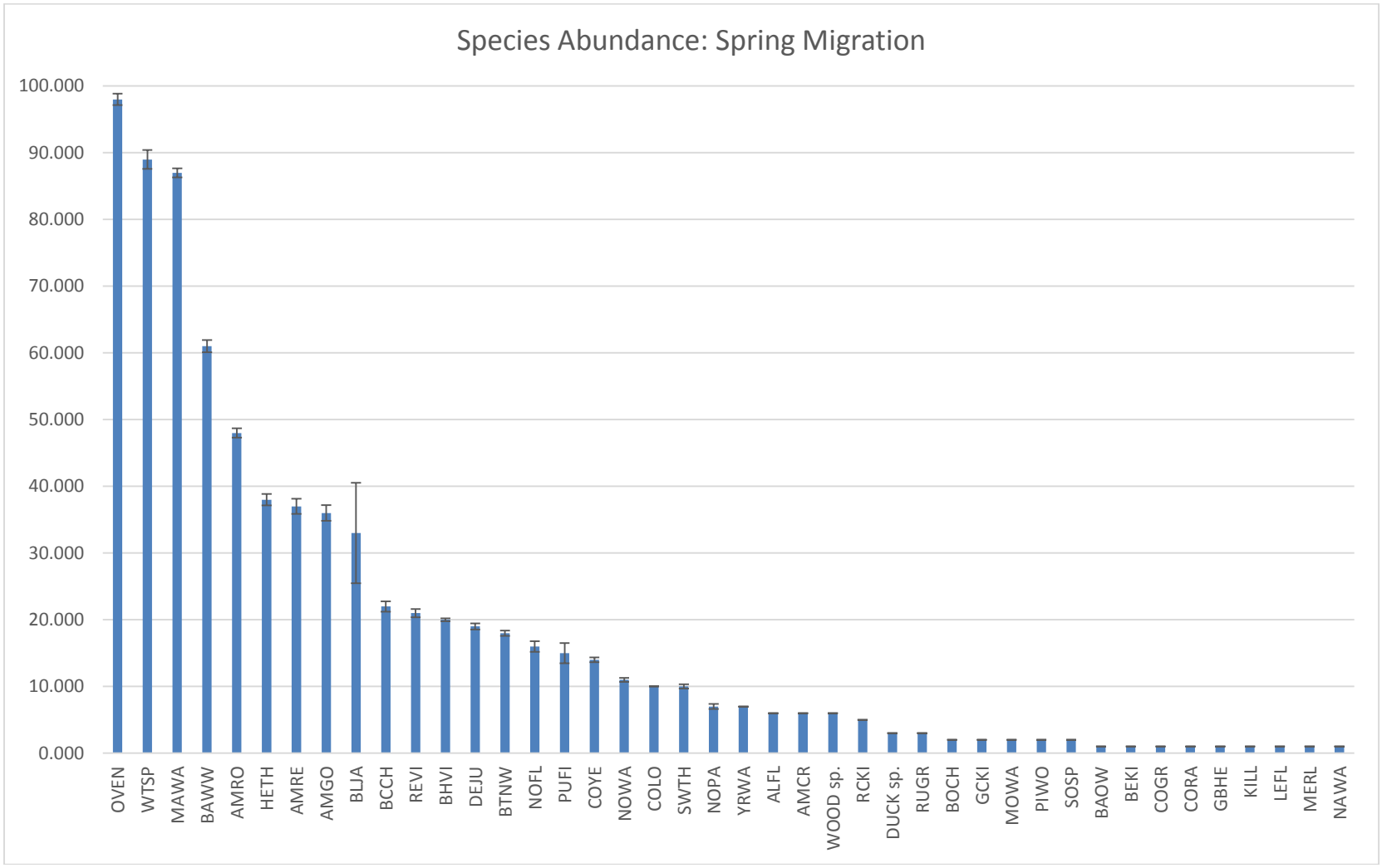


Figure 5. Abundance of birds observed during spring migration (May 15 – May 29, 2012). Error bars show standard deviation. See Table 2 for a list of species codes.

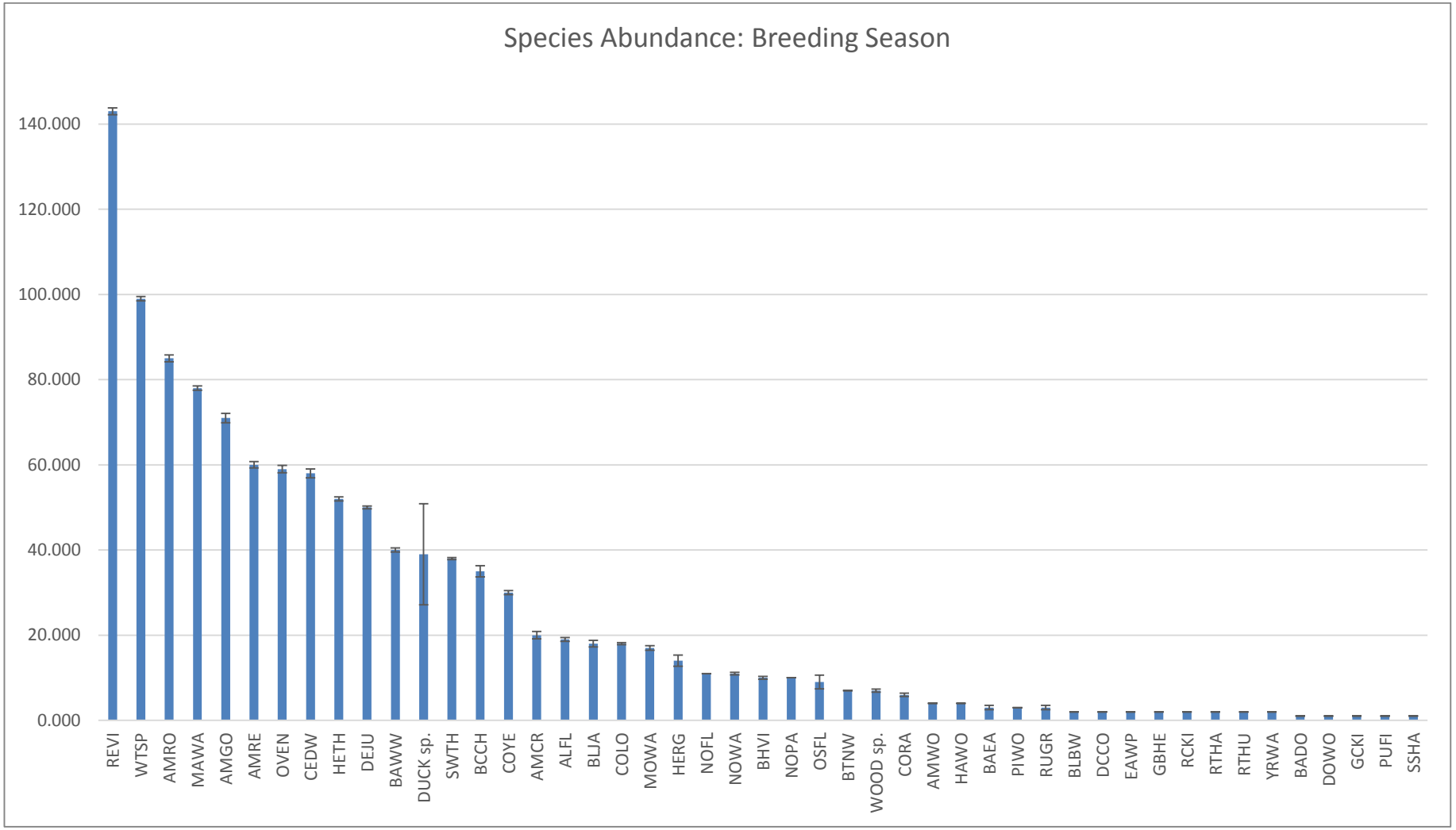


Figure 6. Abundance of birds observed during the summer breeding season (June 1- August 31, 2012). Error bars show standard deviation. See Table 2 for a list of species codes.

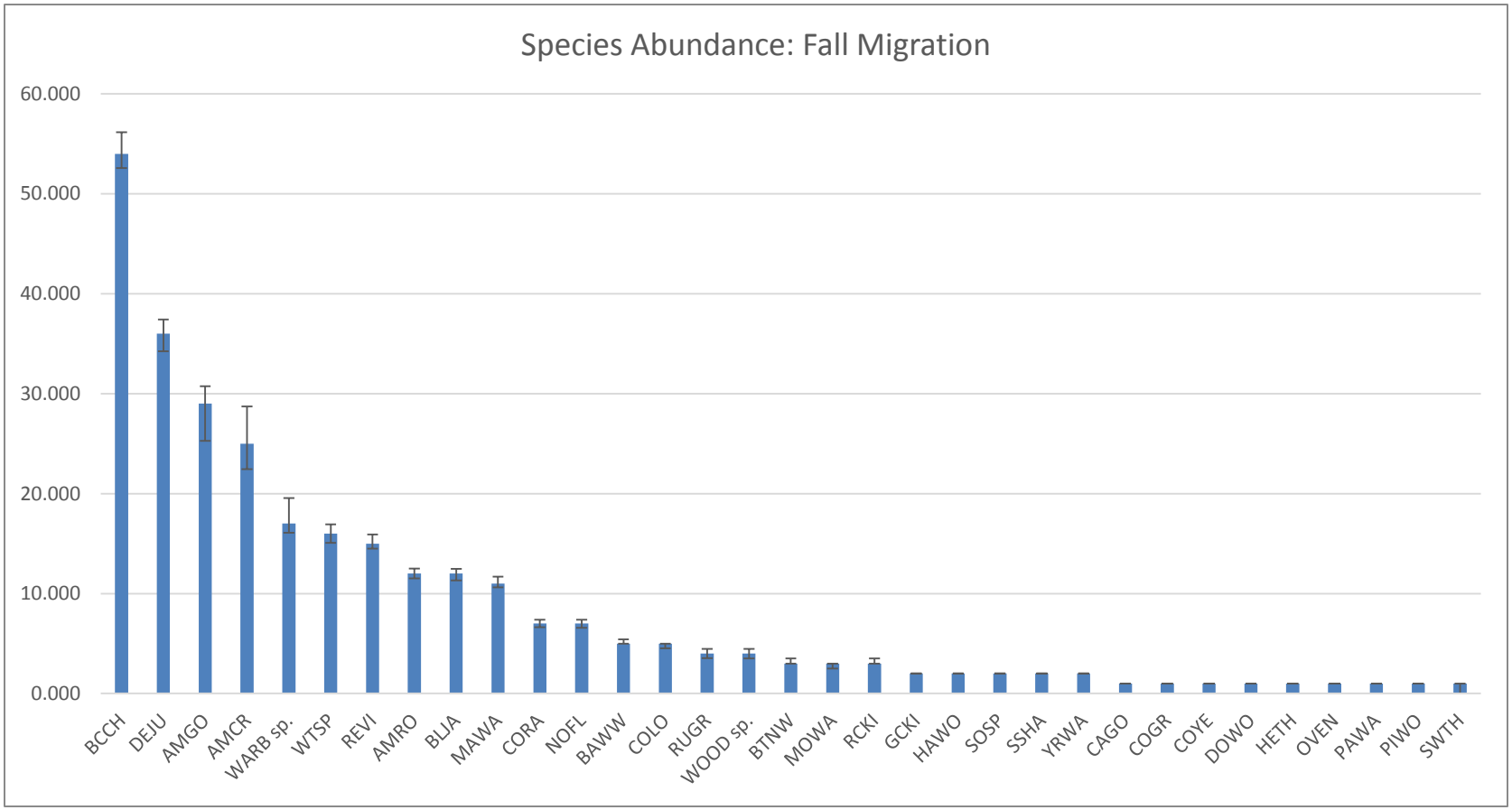


Figure 7. Abundance of birds observed during Fall migration (September 1 – October 19, 2012). Error bars show standard deviation. See Table 2 for a list of species codes.

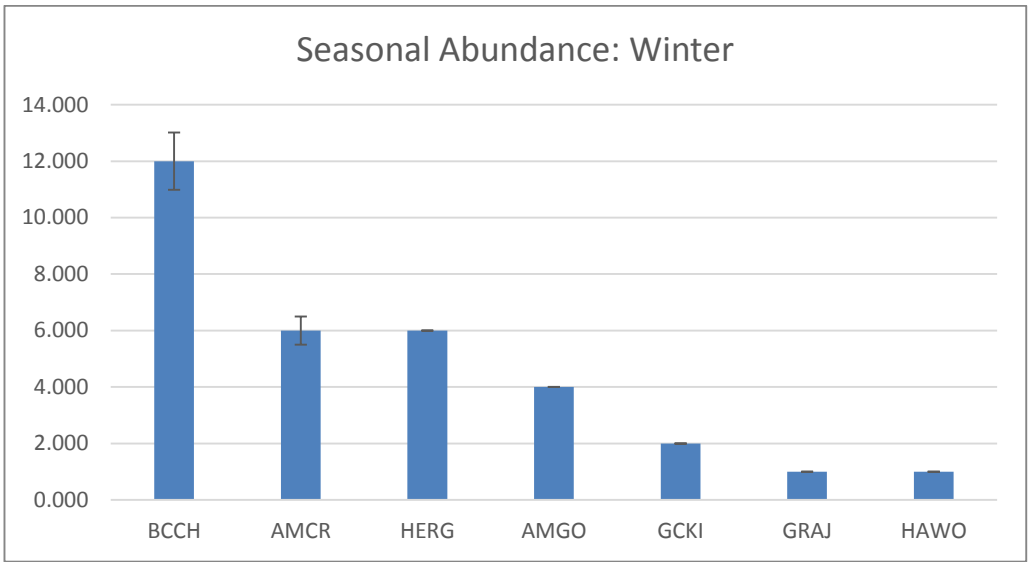


Figure 8. Abundance of birds observed during winter surveys (November 19, 2013 – January 14, 2013). Error bars show standard deviation. See Table 2 for a list of species codes.

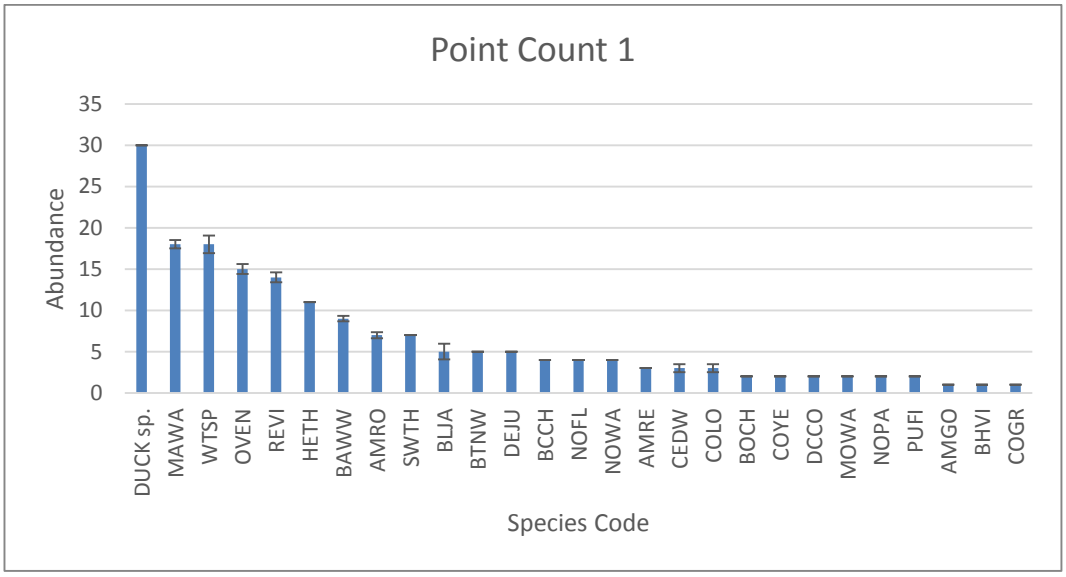


Figure 9. Abundance of species observed at Point Count 1. See Table 2 for a list of species codes

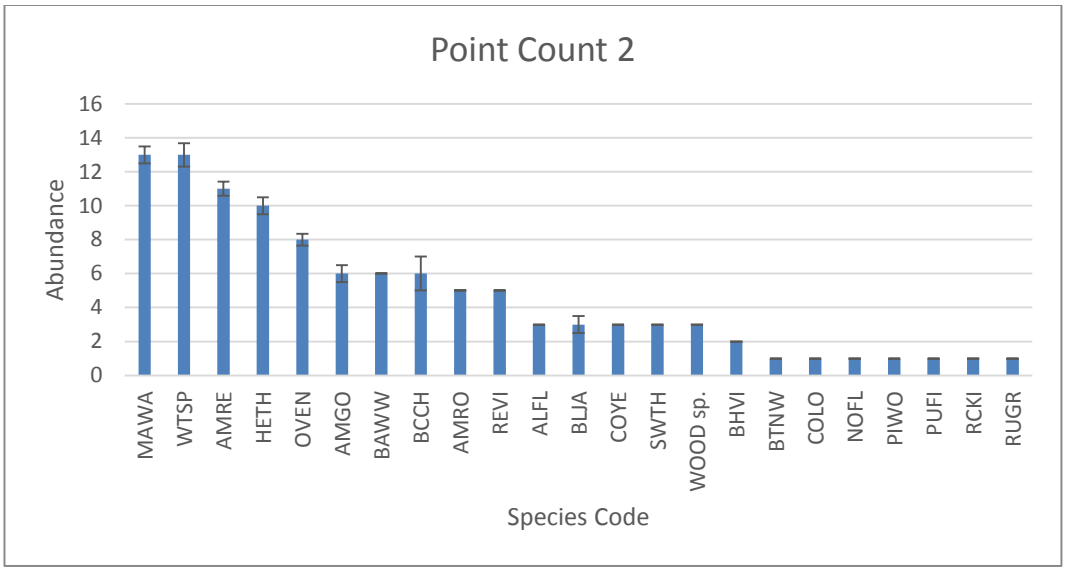


Figure 10. Abundance of species observed at Point Count 2. See Table 2 for a list of species codes.

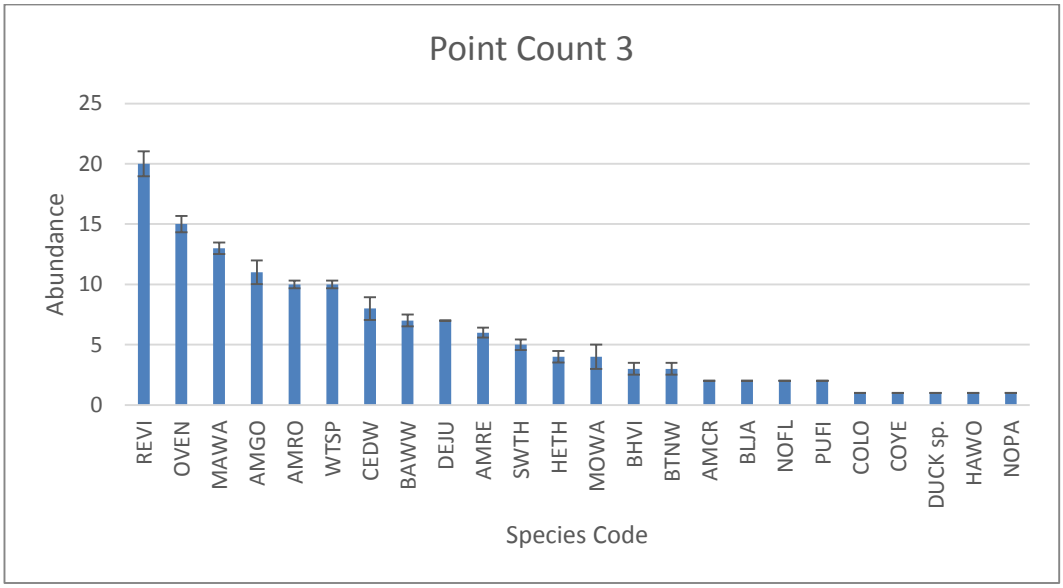


Figure 11. Abundance of species observed at Point Count 3. See Table 2 for a list of species codes.

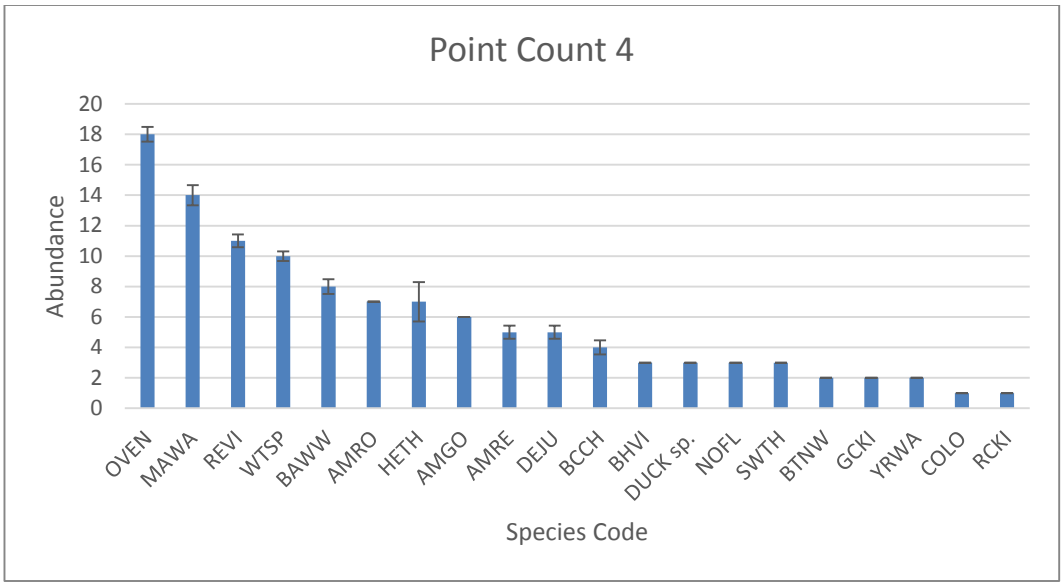


Figure 12. Abundance of species observed at Point Count 4. See Table 2 for a list of species codes.

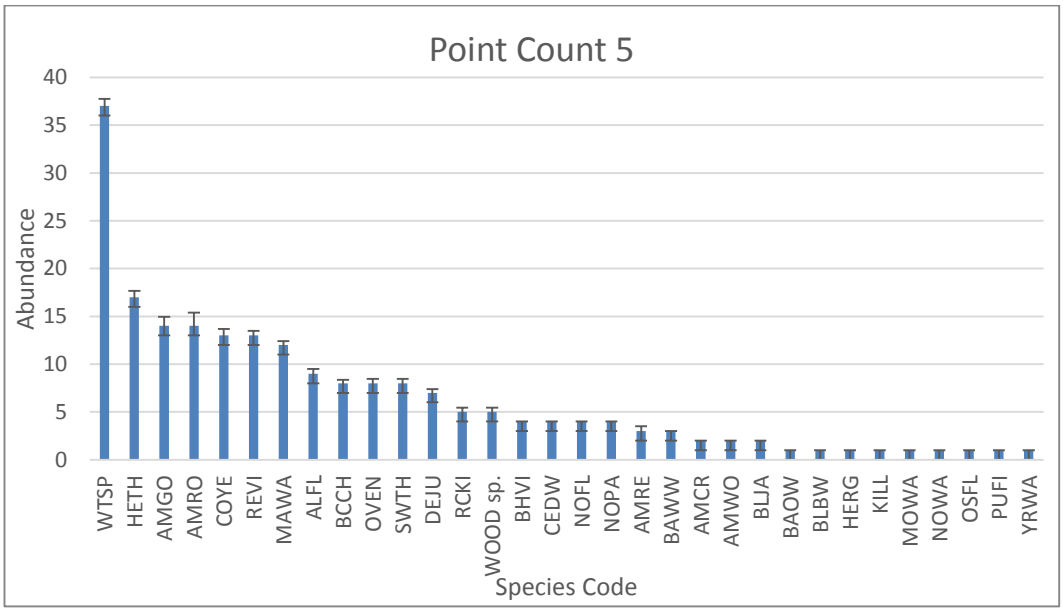


Figure 13. Abundance of species observed at Point Count 5. See Table 2 for a list of species codes.

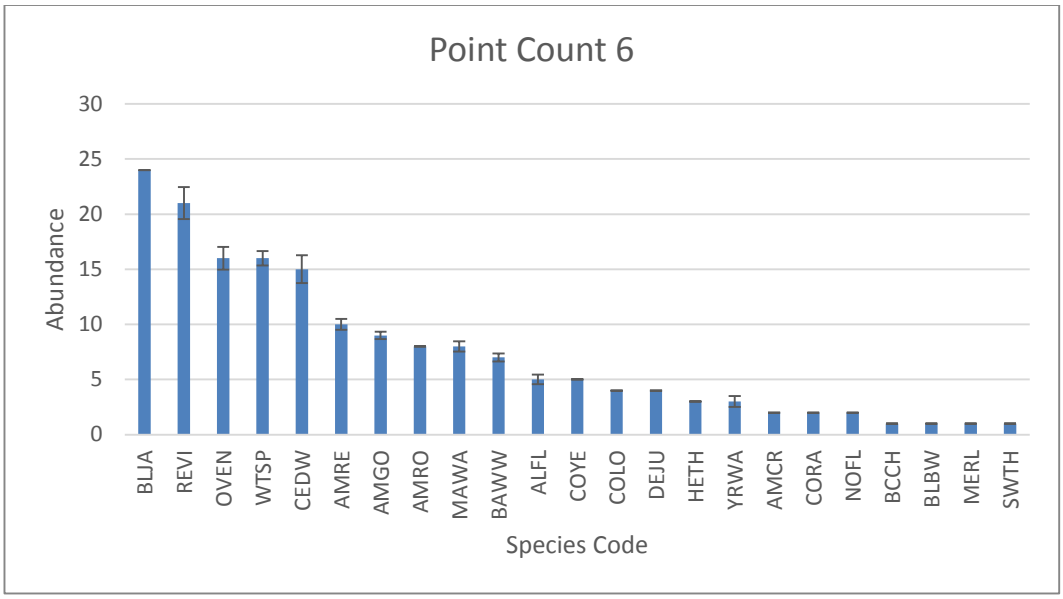


Figure 14. Abundance of species observed at Point Count 6. See Table 2 for a list of species codes.

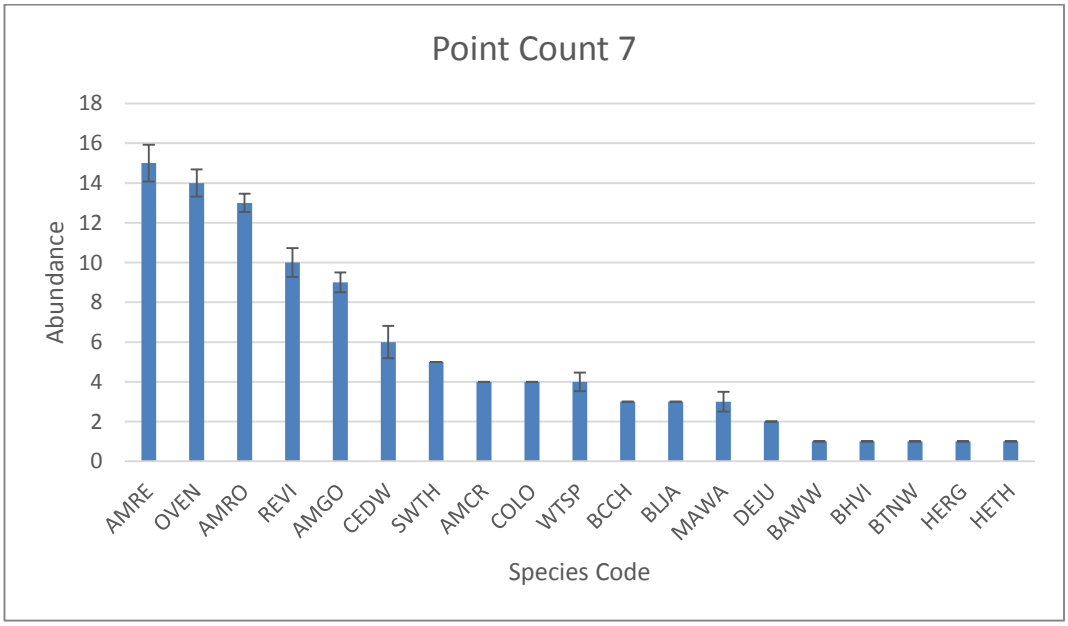


Figure 15. Abundance of species observed at Point Count 7. See Table 2 for a list of species codes.

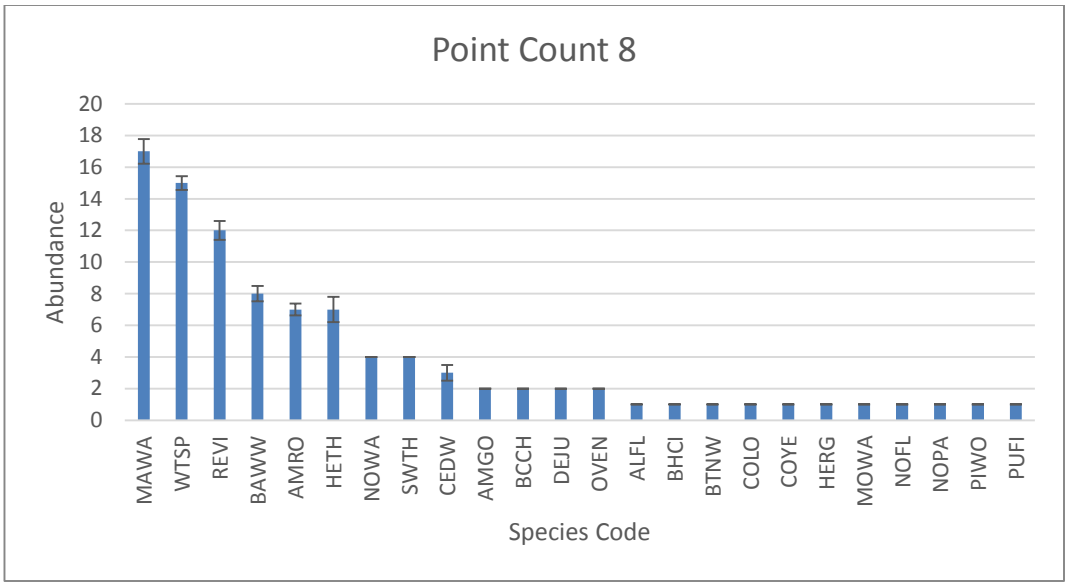


Figure 16. Abundance of species observed at Point Count 8. See Table 2 for a list of species codes.

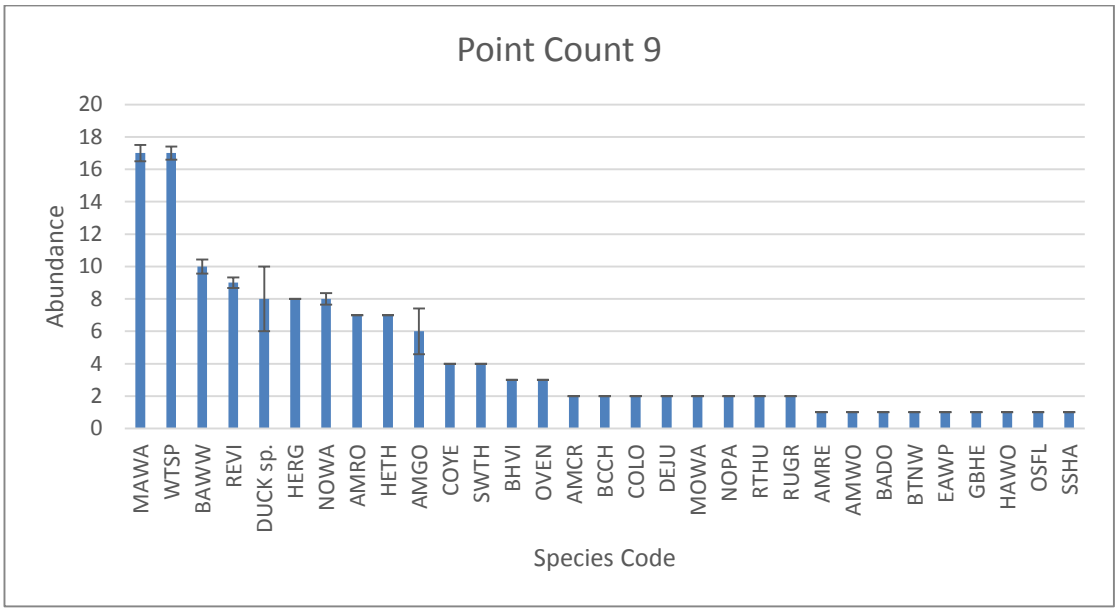


Figure 17. Abundance of species observed at Point Count 9. See Table 2 for a list of species codes.

Appendix B: Priority Species List

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Accipiter gentilis	Northern Goshawk				YELLOW	Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season, which vary among forest types and region. Typically nests in mature or old-growth forests, and generally selects larger tracts of forest over smaller tracts.
Caprimulgus vociferus	Whip-Poor-Will	T			RED	Arrives in the Maritimes in May and leaves for its wintering grounds in August-September. Breed in fairly open or patchy forests, often in relatively dry sites associated with sand plains or rock outcrops and having substantial cover of white and red pine and red oak and sometimes in sites that area regenerating following major disturbances. In the Maritimes, most records are from central and western NB. 0ther areas may support the occasional territorial bird
Sturnella magna	Eastern Meadowlark				YELLOW	Breeds from southeastern Canada through eastern U.S. west to Arizona; resident in the Bahamas and Mexico. Spends winters mostly within breeding range. Preferred habitats include pastures, meadows, grassy fields, prairies, open country and country roadsides. Often seen singing from fence posts or utility wires.
Cathartes aura	Turkey Vulture				YELLOW	Breeds from southern B.C., central Saskatchewan, the Great Lakes, and New Hampshire southward. Spends winters in the Southwest and eastern U.S. northward to southern New England. Preferred habitats include deciduous forests, woodlands and scrublands; often seen over adjacent farmlands.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Sayornis phoebe	**Eastern Phoebe**				**YELLOW**	**Breeds north of Mason-Dixon lines in North America; spends winters as far north as the Ohio River.**
Chordeiles minor	**Common Nighthawk**	**T**	**T**	**Threatened**	**RED**	**Nest throughout Maritimes with the exception of PEI. Nest on the ground in a variety of habitats having little or no tree cover and a limited cover of taller shrubs and herbs, and then can also nest on flat gravel roofs in urban settings. Forest clearings created by forestry or fire are probably the most widely used habitats in the region, but sand dunes, river bars, open forests, commercial blueberry fields, mining and aggregate excavation sites, rocky outcrops and drier peat lands are all potential nesting habitats. Easily observable at dusk or dawn- as they forage in the air for insects.**
Asio otus	**Long-eared Owl**				**RED**	**Occurs Throughout the northern hemisphere. Preferred habitats include dense vegetation close to grasslands or shrub lands, as well as open forests.**
Myiarchus crinitus	Great Crested Flycatcher				RED	Uncommon with few confirmed breeding records broadly scattered over central and southern Nova Scotia. Breeds in deciduous forest (mainly), mixed, or pine woodland or somewhat open forest, parks, orchards, wooded residential areas, areas of scattered trees in cultivated regions, clearings and edges of wooded areas, and swamps. Preferred perches are tall trees, but may also be found on utility lines and short shrub-like growth in recent clear-cuts. Nests in natural cavity or old woodpecker hole in live or dead tree, average of 3-6 m above ground; also in bird box, pipe or similar cavity

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Falco peregrinus anatum	American Peregrine Falcon	SC	SC	Vulnerable	RED	Breed around the Bay of Fundy shore, both in NB and NS on cliff ledges at sites where there is a steady supply of mid-sized birds such as small ducks or shorebirds. Ledges on tall buildings and bridges can also serve as suitable nest sites in urban areas.
Hirundo rustica	**Barn Swallow**				**YELLOW**	**Breeds from Alaska east across Canada to Newfoundland and south throughout most of the U.S.; spends winters in the tropics and Eurasia. Preferred habitats include agricultural lands, suburban areas, marshes and lakeshores.**
Petrochelidon pyrrhonota	**Cliff Swallow**				**RED**	**Cliff swallows inhabit open to semi wooded habitat, cliffs, canyons, and farm country, generally near meadows, marshes, and water. They build bottle-shaped mud nest in colonies on cliffs, under eaves of buildings, under bridges, and similar sites sheltered by an overhang. Many return to same nesting area in successive years, but colonies tend to switch nesting sites between seasons, evidently due to a buildup of insect parasites in the nests. Cliff swallows commonly repair and use old nests. Breeding bird in NS**
Riparia riparia	**Bank Swallow**				**RED**	**Habitat includes open and partly open situations, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks, in burrows dug near the top of the bank, along the edge of inland water, or along the coast, or in gravel pits, road embankments, etc. Breeding Bird NS**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Falco peregrinus	Peregrine Falcon				YELLOW	Breeds from Alaska and the Canadian arctic south locally through the mountainous west, and sparingly in the east. Spends winters on coasts north to B.C., and Massachusetts. Preferred habitats include tundra, savannas, coasts, mountains, and tall buildings.
Contopus cooperi	**Olive-sided Flycatcher**	**T**	**T**		**RED**	**Breeds throughout the maritime provinces. Is most associated with openings or edges in coniferous forest containing tall trees or snags for perching. Bog margins, river valleys, beaver ponds and meadows, slow moving streams with broad floodplains and cut over areas with some standing trees are frequently used habitats.**
Contopus virens	**Eastern Wood-Pewee**				**YELLOW**	**Breeds from eastern Great Plains to the Atlantic ocean, ranging from southern Canada to northern Florida, the gulf coast and central Texas. Winters in the tropics. Preferred habitats include northern hardwood, pine-oak, oak-hickory, bottomland hardwood, southern pine savannah, and Midwestern forests; also found in orchards, parks, roadsides and suburban areas.**
Dendroica castanea	**Bay-breasted Warbler**				**YELLOW**	**Breeds from northeastern B.C. east to Maritime provinces and south to the northern Great Lakes region and northern New England. Spends winters in the tropics. Preferred habitats include open spruce forests and deciduous woodlands.**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Dendroica striata	**Blackpoll Warbler**				**YELLOW**	**Breeds from Alaska and northern Canada to southern Canada and northern New England. Spends winters in the tropics. Preferred breeding habitat is coniferous forests; during migration found chiefly in tall trees.**
Dendroica tigrina	**Cape May Warbler**				**YELLOW**	**Breeds from southern Mackenzie, Manitoba, Ontario and Quebec south to North Dakota, Michigan, northern New York, Maine and Nova Scotia. Spends winters in southern Florida and the West Indies. Preferred habitats, but during migration also found in evergreen or deciduous woodlands, and often parks or suburban yards.**
Empidonax flaviventris	Yellow-bellied Flycatcher				YELLOW	Breeds from central Canada and Newfoundland south to Great Lakes region, northern New York, northern New England, and maritime provinces. Spends winters from Mexico to Panama.
Empidonax traillii	Willow Flycatcher				YELLOW	Breeds from southern B.C., Ab., North Dakota, New York, and Maine south to central California, Nevada, the southwest, Arkansas, and Virginia. Preferred habitats include swampy thickets, upland pastures, and old abandoned orchards; also occurs along wooded lakeshores and streams.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Icterus galbula	**Baltimore Oriole**				**RED**	**Arrive in the northern states and Canada in April-May; males precede females by a few days. Southward migration begins in late July or early August. Habitat includes open woodland, deciduous forest edge, riparian woodland, partly open situations with scattered trees, orchards, and groves of shade trees. In migration and winter this oriole also occurs in humid forest edge, second growth, and scrub; treetop level in coffee and cacao plantations, and savannah groves.**
Molothrus ater	**Brown-headed Cowbird**				**YELLOW**	**Habitat Comments: Breeding habitat includes woodland, forest (primarily deciduous), forest edge, city parks, suburban gardens, farms, and ranches. Cowbirds often are associated with forest-field edge habitat and clearings in forests. Feedlots, pastures, and fields with livestock also attract cowbirds, especially in predominately forested areas. Permanent resident in NS**
Perisoreus canadensis	**Gray Jay**				**YELLOW**	**Resident form Alaska east to Labrador and south across the northern U.S. Most commonly found in coniferous forests.**
Pheucticus ludovicianus	**Rose-breasted Grosbeak**				**YELLOW**	**Breeds from northeastern B.C. Manitoba, and Nova Scotia to southern Alberta, North Dakota, Oklahoma, and New Jersey, and as far south as Georgia; regular visitor on the west coast and winters from central into northern South America. Preferred habitats include moist woodlands, open fields and old, overgrown orchards.**

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Picoides arcticus	Black-backed Woodpecker				YELLOW	Resident in Alaska, Canada, and northern U.S. Preferred habitat includes coniferous forests in the boreal zone, especially where burned, logged, or swampy.
Pinicola enucleator	Pine Grosbeak				RED	Open coniferous (less commonly mixed coniferous-deciduous) forest and forest edge; in migration and winter also in deciduous forest, woodland, second growth and shrubbery. Nests in trees or shrubs in open coniferous woods, 2-9 m above ground Non breeding resident in NS
Poecile hudsonica	Boreal Chickadee				YELLOW	Boreal coniferous and mixed forests, muskeg bogs, vicinity of white cedar and hemlock swamps, birches and streamside willows. Nests in natural cavities or abandoned woodpecker holes, or in cavity dug by pair in rotten tree stub, usually within 1 m of ground. Permanent resident. Breeds from northern Alaska east to Labrador and Newfoundland, south to northern edge of U.S. Occasionally wanders southward during winter. Usually found in coniferous forests.
Euphagus carolinus	Rusty Blackbird	SC	SC		Red	Breed in wet forest and thicket habitats, generally in conifer dominated landscapes. Lake and river shore swamps, streamside thickets beaver ponds, peat lands, and shrubby or forested margins of sedge meadows and marshes are typical habitats. Most likely to be found in the more boreal habitats at higher elevations or coast influenced areas. Breeds from Alaska across northern Canada to southern Canada, northern New York, and northern New England. Preferred habitats include beaver ponds, roadsides, landfills, wet meadows, and

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
						shrubby shorelines.
Regulus calendula	Ruby-crowned Kinglet				YELLOW	Breeds from Alaska east across Canada to Newfoundland, south California and New Mexico, and to the Great Lakes region and southern New England in the east. Spends winters south from southern B.C. and California across the southern tier of the states to southern New England. Preferred habitats include coniferous and deciduous forests.
Regulus satrapa	Golden-crowned Kinglet				YELLOW	Common from southern Alaska to central Canada and southeast to the Carolinas; spends winters south to Florida and the Gulf Coast. Preferred habitat include dense conifer forests; also found in deciduous and mixed forests.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Sialia sialis	**Eastern Bluebird**	**NAR**			**YELLOW**	**Habitat includes forest edge, open woodland, and partly open situations with scattered trees, from coniferous or deciduous forest to riparian woodland, also pine woodland or savannah in the tropics. Breeding Bird- NS- northern portions only - towards Amherst and Pictou-Antigonish counties. Breeds east of the Rockies from southeast Canada to the Gulf of Mexico; winters in southern portion of breeding range. Inhabits open woodlands, clearings, farmlands, parks, orchards, gardens, fields, often seen along roadsides on utility wires and fences.**
Spinus pinus	**Pine Siskin**				**YELLOW**	**Breeds from southern Alaska, Mackenzie, Quebec, and Newfoundland south to California, Arizona, New Mexico, Texas, Great Lakes region, and northern New England; wanders southward throughout the U.S. during winter. Preferred habitats include coniferous and deciduous forests, woodlands, parks, alder thickets, and brushy pastures.**
Tachycineta bicolor	Tree Swallow				YELLOW	Breeds from Alaska east through northern Manitoba to Newfoundland and south to California, Colorado, Nebraska, and Maryland. Spends winters north to southern California, the Gulf Coast, and the Carolinas. Preferred habitats include open areas near water, such as fields, marshes, meadows, shorelines, beaver ponds, and wooded swamps and standing dead trees.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NS DNR	Habitat Description
Tyrannus tyrannus	Eastern Kingbird				YELLOW	Breeds from British Columbia across interior Canada to Maritime Provinces and south to Northern California, central Texas, the Gulf coast, and Florida. Spends winters in the tropics. Inhabits open woodlands, clearings, rural roadsides, farms, orchards, edges of fields, streams, and suburbs.
Vermivora peregrina	Tennessee Warbler				YELLOW	Breeds from Yukon, Manitoba, and Labrador south to B.C., Wisconsin, southern Ontario, and Maine. Spends winters in the tropics. Preferred habitats include open mixed woodlands in the breeding season; trees and bushes during migration.
Wilsonia canadensis	Canada Warbler	T	T		RED	Found throughout the Maritimes- breeds in a variety of forest types- always in areas with a well-developed shrub layer and frequently in moist to wet sites. Forested swamps with some combination of white cedar, black spruce, red maple, and tamarack and dense mixed forests on steep river valley slopes are favoured habitat.
Wilsonia pusilla	Wilson's Warbler				YELLOW	Breeds from Alaska eastward to Newfoundland and south to southern California, New Mexico, central Ontario, and Nova Scotia. Spends winters in the tropics. Preferred habitats include moist thickets in woodlands and along streams as well as alder, willow thickets, and bogs.

Appendix C: ACCDC report

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

DATA REPORT 4989: Mulgrave, NS

Prepared 17 April, 2013
by S.L. Robinson, Data Manager

CONTENTS OF REPORT

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of circa 85 NatureServe data centres and heritage programs in 50 states, 10 provinces and 1 territory, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies, plus 4 provincial governments, outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC reports known observations of rare and endangered flora and fauna, in and near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and also known sites of ecological interest. Data summarised in each report is attached as DBF files which may be opened from within data software (Excel, Access) or mapped in GIS (ArcView, MapInfo, AutoCAD).

1.1 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

a.) Data is restricted to use by trained personnel who are sensitive to landowner interests and the potential threat of the information contained here to rare and/or endangered flora and fauna.
b.) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c.) The ACCDC requires Data Users to cease using and delete data 12 months after receipt.
d.) ACCDC data responses are restricted to that data in our Data System at the time of the data request.
e.) Data is qualified in regard to locational uncertainy and period of observation; cf Data Dictionary for details.
f.) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g.) The non-occurrence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.2 ADDITIONAL INFORMATION

Please direct biological questions about ACCDC data to: Sarah Robinson, ACCDC: (506) 364-2664, and technical data queries to: Samara Eaton, CWS (NB and PE): (506) 364-5060 or Julie McKnight, CWS (NS): (902) 426-4196.

For provincial information on rare taxa and protected areas, or information on game animals, deer yards, old growth forest, archeological sites, fish habitat etc, please contact Sherman Boates, NSDNR: (902) 679-6146.

2.0 RARE AND ENDANGERED TAXA

A 100km buffer around the study area contains 4706 records of 380 taxa from 89 sources, a relatively low-to-moderate density of records (quintile 2): 0.15 rec/km2.

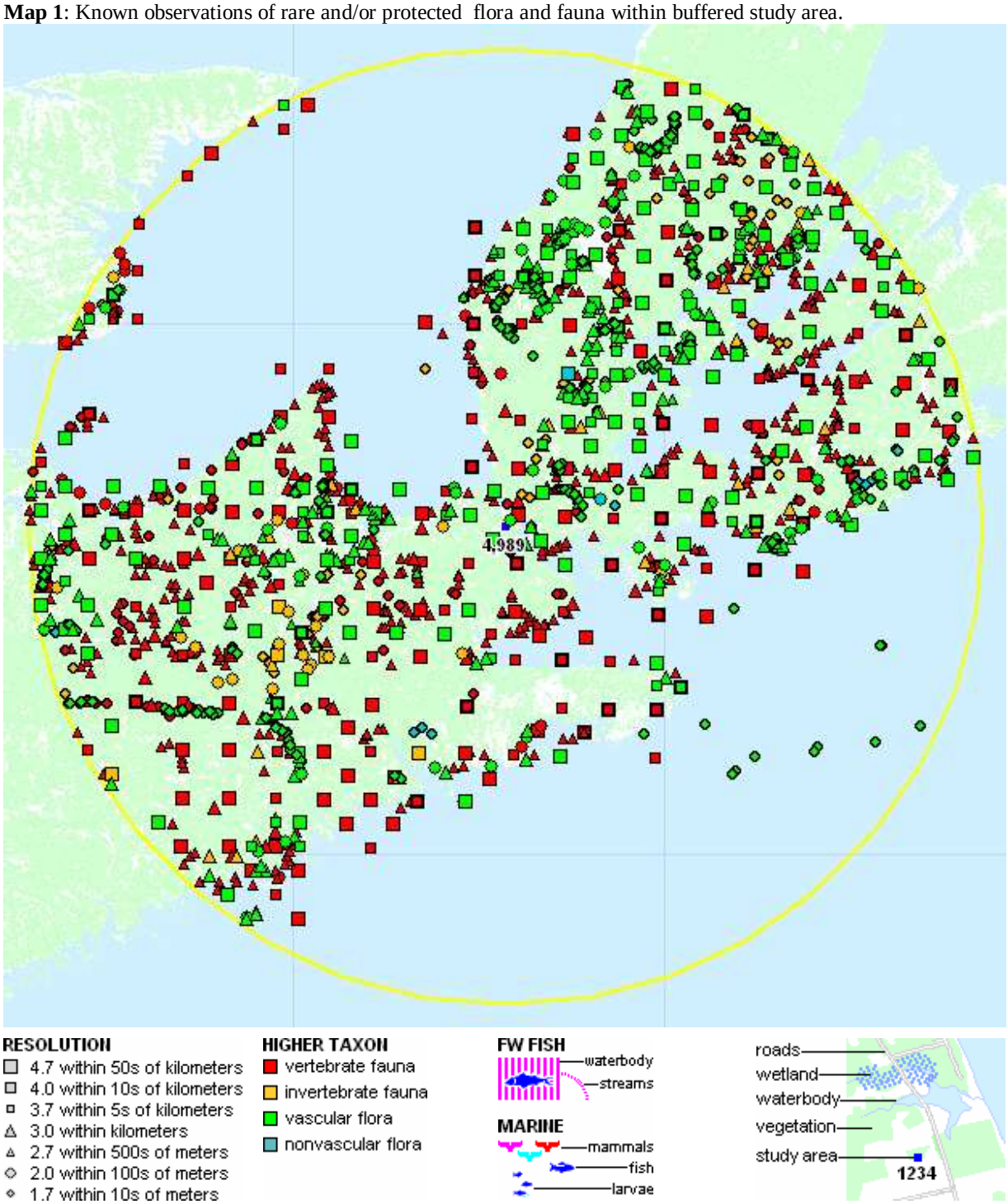
2.1 FLORA

A 100km buffer around the study area contains 1018 records of 224 vascular, 21 records of 12 nonvascular flora (see attached *ob.dbf).

2.2 FAUNA

A 100km buffer around the study area contains 3470 records of 100 vertebrate, 197 records of 44 invertebrate fauna (cf attached *ob.dbf). Sensitive data: Wood Turtles are POTENTIALLY present in the study area (cf attached WOTU.rtf).

Map 1: Known observations of rare and/or protected flora and fauna within buffered study area.



3.0 SPECIAL AREAS

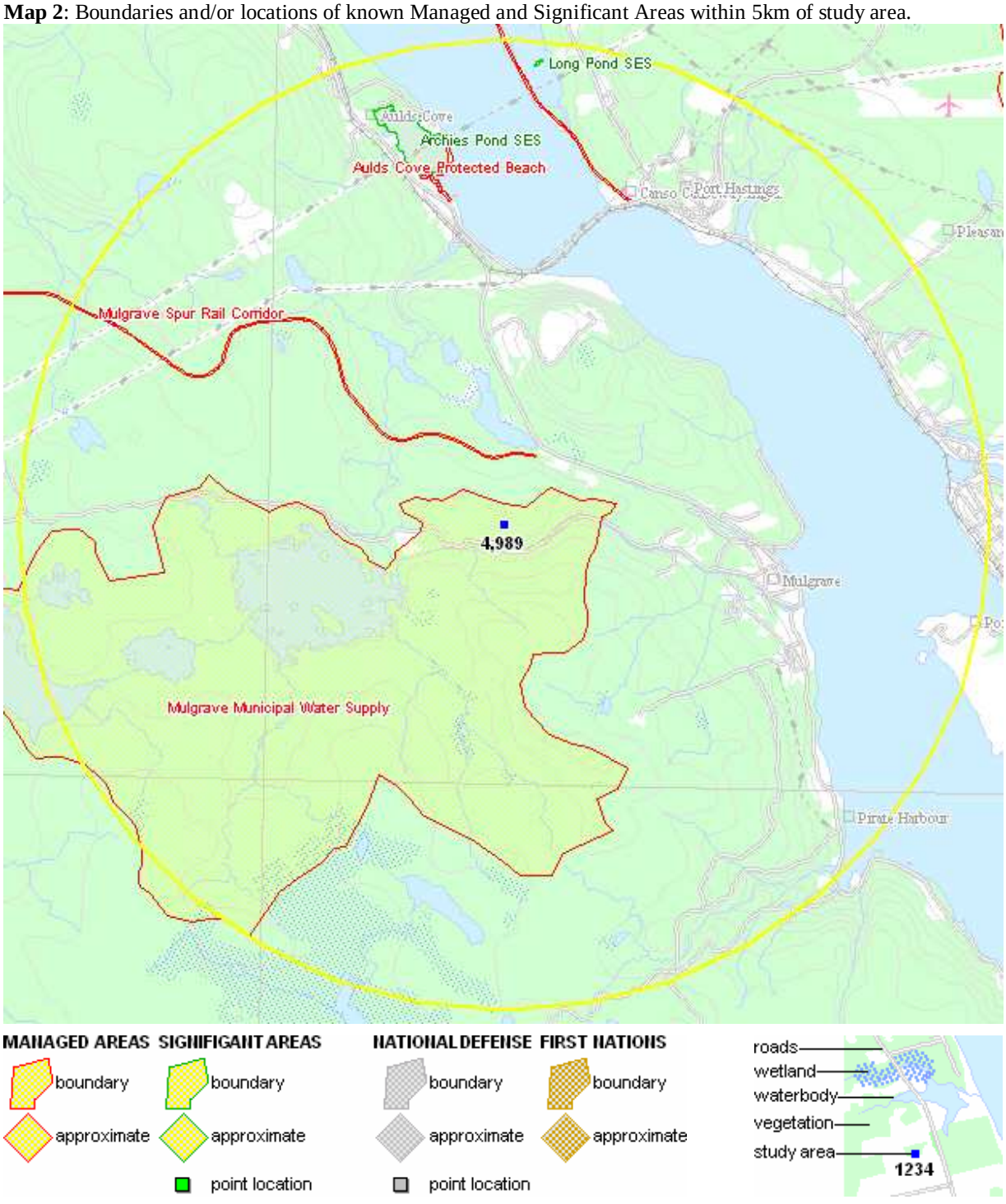
3.1 MANAGED AREAS

The GIS scan identified 4 Managed Areas with some degree of protected status, in the vicinity of the study area (see attached *ma.dbf).

3.2 SIGNIFICANT AREAS

The GIS scan also identified 2 biologically significant sites in the vicinity of the study area; such sites are known for exceptional biotic richness but may or may not have legal status (see attached *sa.dbf).

Map 2: Boundaries and/or locations of known Managed and Significant Areas within 5km of study area.



4.0 TAXON LISTS

Rare and/or endangered taxa within the buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation. [p] = vascular plant, [n] = nonvascular plant, [a] = vertebrate animal, [i] = invertebrate animal, [c] = community.

4.1 FLORA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km
p	Juncus caesariensis	New Jersey Rush	S2	Vulnerable	SC	23	56 ±0
n	Degelia plumbea	Blue Felt Lichen	S2		SC	8	21 ±0.1
p	Floerkea proserpinacoides	False Mermaidweed	S2		NAR	12	13 ±0.1
p	Thuja occidentalis	Eastern White Cedar	S1S2	Vulnerable		1	58 ±10
p	Equisetum palustre	Marsh Horsetail	S1			1	47 ±0
p	Cystopteris laurentiana	Laurentian Bladder Fern	S1			3	48 ±0
p	Cryptogramma stelleri	Steller's Rockbrake	S1			5	44 ±5
p	Potamogeton nodosus	Long-leaved Pondweed	S1			1	80 ±5
p	Trisetum melicoides	Purple False Oats	S1			1	92 ±0
p	Torreyochloa pallida var. pallida	Pale False Manna Grass	S1			1	93 ±10
p	Elymus hystrix var. bigeloviana	Spreading Wild Rye	S1			1	93 ±1
p	Elymus wiegandii	Wiegand's Wild Rye	S1			8	16 ±0
p	Cinna arundinacea	Sweet Wood Reed Grass	S1			3	15 ±0
p	Bromus latiglumis	Broad-Glumed Brome	S1			2	15 ±0
p	Malaxis brachypoda	White Adder's-Mouth	S1			1	4 ±10
p	Triantha glutinosa	Sticky False Asphodel	S1			4	59 ±0
p	Iris prismatica	Slender Blue Flag	S1			3	54 ±10
p	Scirpus pedicellatus	Stalked Bulrush	S1			3	15 ±0
p	Rhynchospora capillacea	Slender Beakrush	S1			5	55 ±1
p	Cyperus lupulinus ssp. macilentus	Hop Flatsedge	S1			4	30 ±1
p	Carex grisea	Inflated Narrow-leaved Sedge	S1			1	38 ±0
p	Carex viridula var. elatior	Greenish Sedge	S1			3	55 ±0
p	Carex tincta	Tinged Sedge	S1			2	25 ±1
p	Carex tenuiflora	Sparse-Flowered Sedge	S1			2	49 ±1
p	Carex livida var. radicaulis	Livid Sedge	S1			5	48 ±5
p	Carex livida	Livid Sedge	S1			2	55 ±0
p	Carex pellita	Woolly Sedge	S1			1	98 ±0
p	Carex haydenii	Hayden's Sedge	S1			1	63 ±5
p	Carex gynocrates	Northern Bog Sedge	S1			1	61 ±0.1
p	Carex granularis	Limestone Meadow Sedge	S1			1	53 ±0
p	Carex alopecoidea	Foxtail Sedge	S1			1	28 ±0.5
p	Viola canadensis	Canada Violet	S1			1	50 ±1
p	Pilea pumila	Dwarf Clearweed	S1			1	83 ±10
p	Scrophularia lanceolata	Lance-leaved Figwort	S1			2	19 ±10
p	Salix candida	Sage Willow	S1			2	59 ±0
p	Montia fontana	Water Blinks	S1			1	6 ±1
p	Polygonum viviparum	Alpine Bistort	S1			1	43 ±1
p	Desmodium canadense	Canada Tick-trefoil	S1			1	98 ±0
p	Cuscuta cephalanthi	Buttonbush Dodder	S1			3	24 ±10
p	Hypericum majus	Large St John's-wort	S1			2	61 ±1
p	Hudsonia tomentosa	Woolly Beach-heath	S1			3	73 ±10
p	Suaeda maritima ssp. richii	White Sea-blite	S1			4	19 ±10
p	Lobelia kalmii	Brook Lobelia	S1			10	36 ±0.1
p	Cochlearia tridactylites	Limestone Scurvy-grass	S1			6	49 ±10
p	Cardamine pratensis var. angustifolia	Cuckoo Flower	S1			3	32 ±10
p	Cardamine pratensis	Cuckoo Flower	S1			5	41 ±0
p	Ageratina altissima	White Snakeroot	S1			2	33 ±10
p	Bidens hyperborea	Estuary Beggarticks	S1			3	39 ±1
p	Arnica lonchophylla	Northern Arnica	S1			1	38 ±10
p	Zizia aurea	Golden Alexanders	S1			5	32 ±1
p	Sanicula odorata	Clustered Sanicle	S1			4	58 ±10
n	Parmeliella parvula	Poor-man's Shingles Lichen	S1?			2	75 ±0
p	Dichanthelium acuminatum var. lindheimeri	Woolly Panic Grass	S1?			1	92 ±0.1
p	Triglochin gaspensis	Gaspé Arrowgrass	S1?			3	16 ±0
p	Schoenoplectus robustus	Sturdy Bulrush	S1?			2	74 ±5
p	Rubus flagellaris	Northern Dewberry	S1?			1	46 ±5
p	Crataegus submollis	Quebec Hawthorn	S1?			2	53 ±10
p	Amelanchier stolonifera	Running Serviceberry	S1?			1	99 ±1
p	Suaeda calceoliformis	Horned Sea-blite	S1?			5	91 ±1
p	Chenopodium rubrum	Red Pigweed	S1?			3	37 ±10
p	Atriplex acadiensis	Maritime Saltbush	S1?			1	73 ±10
p	Solidago hispida	Hairy Goldenrod	S1?			1	93 ±10
n	Nephroma arcticum	Arctic Kidney Lichen	S1S2			1	66 ±10
p	Woodsia alpina	Alpine Cliff Fern	S1S2			1	93 ±0.5
p	Sparganium hyperboreum	Northern Burreed	S1S2			4	50 ±0.1
p	Calamagrostis stricta ssp. stricta	Slim-stemmed Reed Grass	S1S2			1	76 ±1
p	Juncus alpinoarticulatus ssp. nodulosus	Alpine Rush	S1S2			7	31 ±1
p	Juncus stygius ssp. americanus	Moor Rush	S1S2			6	51 ±1
p	Juncus stygius	Moor Rush	S1S2			2	55 ±0
p	Juncus greenei	Greene's Rush	S1S2			2	30 ±1
p	Carex tenera	Tender Sedge	S1S2			3	12 ±1
p	Carex pensylvanica	Pennsylvania Sedge	S1S2			1	64 ±0
p	Carex bebbii	Bebb's Sedge	S1S2			8	33 ±10
p	Ranunculus sceleratus	Cursed Buttercup	S1S2			1	82 ±10
p	Anemone virginiana var. alba	Virginia Anemone	S1S2			4	47 ±0.1
p	Utricularia resupinata	Inverted Bladderwort	S1S2			1	66 ±0.1

p	Cornus suecica	Swedish Bunchberry	S1S2	1	50 ±5
p	Carex vacillans	Estuarine Sedge	S1S3	1	28 ±0.5
p	Equisetum pratense	Meadow Horsetail	S2	4	66 ±0
p	Woodsia glabella	Smooth Cliff Fern	S2	4	49 ±0.1
p	Polystichum lonchitis	Northern Holly Fern	S2	4	28 ±5
p	Dryopteris fragrans var. remotiuscula	Fragrant Wood Fern	S2	1	8 ±10
p	Asplenium trichomanes-ramosum	Green Spleenwort	S2	6	45 ±1
p	Asplenium trichomanes	Maidenhair Spleenwort	S2	1	5 ±0.1
p	Potamogeton friesii	Fries' Pondweed	S2	3	17 ±0
p	Spiranthes lucida	Shining Ladies'-Tresses	S2	9	42 ±0
p	Listera australis	Southern Twayblade	S2	4	15 ±10
p	Cypripedium reginae	Showy Lady's-Slipper	S2	17	8 ±10
p	Cypripedium parviflorum var. makasin	Yellow Lady's-slipper	S2	1	51 ±0.1
p	Cypripedium parviflorum var. pubescens	Yellow Lady's-slipper	S2	4	2 ±0.1
p	Allium schoenoprasum var. sibiricum	Wild Chives	S2	1	38 ±10
p	Juncus trifidus	Highland Rush	S2	2	53 ±5
p	Eriophorum gracile	Slender Cottongrass	S2	1	53 ±1
p	Eleocharis quinqueflora	Few-flowered Spikerush	S2	12	41 ±0
p	Carex scirpoidea	Scirpuslike Sedge	S2	1	100 ±5
p	Carex hystericina	Porcupine Sedge	S2	7	32 ±0
p	Carex comosa	Bearded Sedge	S2	1	73 ±10
p	Carex castanea	Chestnut Sedge	S2	1	100 ±5
p	Carex atratiformis	Scabrous Black Sedge	S2	2	49 ±1
p	Carex atlantica ssp. capillacea	Atlantic Sedge	S2	2	32 ±10
p	Symplocarpus foetidus	Eastern Skunk Cabbage	S2	2	59 ±0
p	Viola nephrophylla	Northern Bog Violet	S2	4	31 ±1
p	Tiarella cordifolia	Heart-leaved Foamflower	S2	1	95 ±10
p	Saxifraga paniculata ssp. neogaea	White Mountain Saxifrage	S2	2	50 ±10
p	Parnassia palustris var. parviflora	Marsh Grass-of-Parnassus	S2	4	52 ±0.5
p	Comandra umbellata	Bastard's Toadflax	S2	1	28 ±10
p	Salix pedicellaris	Bog Willow	S2	3	34 ±0
p	Galium labradoricum	Labrador Bedstraw	S2	2	61 ±0
p	Ranunculus flammula var. flammula	Lesser Spearwort	S2	1	48 ±10
p	Caltha palustris	Yellow Marsh Marigold	S2	10	52 ±10
p	Anemone virginiana	Virginia Anemone	S2	5	39 ±0
p	Anemone quinquefolia	Wood Anemone	S2	3	66 ±0.5
p	Anemone canadensis	Canada Anemone	S2	2	13 ±0.1
p	Pyrola minor	Lesser Pyrola	S2	3	48 ±1
p	Samolus valerandi ssp. parviflorus	Seaside Brookweed	S2	2	38 ±0
p	Rumex salicifolius var. mexicanus	Triangular-valve Dock	S2	4	19 ±5
p	Oenothera fruticosa ssp. glauca	Narrow-leaved Evening Primrose	S2	1	94 ±10
p	Myriophyllum farwellii	Farwell's Water Milfoil	S2	3	8 ±10
p	Vaccinium uliginosum	Alpine Bilberry	S2	2	83 ±10
p	Vaccinium caespitosum	Dwarf Bilberry	S2	10	63 ±0
p	Vaccinium boreale	Northern Blueberry	S2	11	43 ±1
p	Empetrum eamesii	Pink Crowberry	S2	1	99 ±5
p	Shepherdia canadensis	Soapberry	S2	12	47 ±0
p	Crassula aquatica	Water Pygmyweed	S2	3	48 ±10
p	Triosteum aurantiacum	Orange-fruited Tinker's Weed	S2	31	30 ±1
p	Stellaria humifusa	Saltmarsh Starwort	S2	3	81 ±0.1
p	Draba arabisans	Rock Whitlow-Grass	S2	1	48 ±1
p	Betula michauxii	Newfoundland Dwarf Birch	S2	6	57 ±0
p	Betula borealis	Northern Birch	S2	2	60 ±10
p	Caulophyllum thalictroides	Blue Cohosh	S2	10	16 ±0
p	Impatiens pallida	Pale Jewelweed	S2	7	16 ±1
p	Senecio pseudoarnica	Seabeach Ragwort	S2	7	6 ±1
p	Rudbeckia laciniata var. gaspereauensis	Cut-Leaved Coneflower	S2	1	33 ±10
p	Hieracium robinsonii	Robinson's Hawkweed	S2	1	98 ±0.5
p	Erigeron philadelphicus	Philadelphia Fleabane	S2	6	43 ±10
p	Osmorhiza longistylis	Smooth Sweet Cicely	S2	11	31 ±1
n	Scorpidium scorpioides	Hooked Scorpion Moss	S2?	1	53 ±10
n	Platydictya jungermannioides	False Willow Moss	S2?	1	40 ±0
n	Paludella squarrosa	Tufted Fen Moss	S2?	1	74 ±5
p	Dichanthelium linearifolium	Narrow-leaved Panic Grass	S2?	1	93 ±10
p	Juncus dudleyi	Dudley's Rush	S2?	15	42 ±0
p	Amelanchier fernaldii	Fernald's Serviceberry	S2?	2	43 ±1
p	Epilobium coloratum	Purple-veined Willowherb	S2?	2	38 ±0.5
p	Symphyotrichum boreale	Boreal Aster	S2?	4	53 ±0
p	Hieracium kalmii	Kalm's Hawkweed	S2?	1	62 ±0.1
n	Peltigera collina	Tree Pelt Lichen	S2S3	2	21 ±0.1
n	Usnea mutabilis	Bloody Beard Lichen	S2S3	1	35 ±10
n	Leptogium teretiusculum	Beaded Jellyskin Lichen	S2S3	1	97 ±0
p	Potamogeton zosteriformis	Flat-stemmed Pondweed	S2S3	5	58 ±0
p	Potamogeton richardsonii	Richardson's Pondweed	S2S3	5	19 ±5
p	Potamogeton obtusifolius	Blunt-leaved Pondweed	S2S3	12	17 ±0
p	Stuckenia filiformis ssp. alpina	Thread-leaved Pondweed	S2S3	16	16 ±0
p	Poa glauca	Glaucous Blue Grass	S2S3	2	48 ±0
p	Alopecurus aequalis	Short-awned Foxtail	S2S3	9	17 ±0
p	Cypripedium parviflorum	Yellow Lady's-slipper	S2S3	18	36 ±0.1
p	Lilium canadense	Canada Lily	S2S3	24	15 ±0
p	Eleocharis olivacea	Yellow Spikerush	S2S3	2	43 ±5
p	Carex hirtifolia	Pubescent Sedge	S2S3	6	16 ±0
p	Carex adusta	Lesser Brown Sedge	S2S3	1	86 ±5
p	Veronica serpyllifolia ssp. humifusa	Thyme-Leaved Speedwell	S2S3	2	81 ±0
p	Salix pellita	Satiny Willow	S2S3	1	6 ±1
p	Polygonum raii	Sharp-fruited Knotweed	S2S3	5	28 ±1

p	Polygala sanguinea	Blood Milkwort	S2S3	1	96 ±1
p	Fraxinus nigra	Black Ash	S2S3	27	16 ±0
p	Hedeoma pulegioides	American False Pennyroyal	S2S3	2	55 ±5
p	Halenia deflexa	Spurred Gentian	S2S3	4	34 ±0.1
p	Hypericum dissimulatum	Disguised St John's-wort	S2S3	1	29 ±1
p	Betula pumila	Bog Birch	S2S3	2	60 ±0
p	Symphyotrichum ciliolatum	Fringed Blue Aster	S2S3	2	48 ±10
p	Asclepias incarnata ssp. pulchra	Swamp Milkweed	S2S3	5	47 ±1
p	Equisetum variegatum	Variegated Horsetail	S3	7	42 ±0
p	Sparganium natans	Small Burreed	S3	4	44 ±0.5
p	Dichanthelium clandestinum	Deer-tongue Panic Grass	S3	8	64 ±5
p	Platanthera orbiculata	Small Round-leaved Orchid	S3	3	35 ±5
p	Platanthera hookeri	Hooker's Orchid	S3	3	5 ±0.1
p	Platanthera grandiflora	Large Purple Fringed Orchid	S3	12	12 ±1
p	Goodyera repens	Lesser Rattlesnake-plantain	S3	9	18 ±0
p	Goodyera oblongifolia	Menzies' Rattlesnake-plantain	S3	6	79 ±10
p	Corallorhiza trifida	Early Coralroot	S3	5	37 ±5
p	Juncus subcaudatus	Woodland Rush	S3	1	98 ±10
p	Schoenoplectus torreyi	Torrey's Bulrush	S3	2	90 ±0
p	Cyperus dentatus	Toothed Flatsedge	S3	2	70 ±0
p	Carex wiegandii	Wiegand's Sedge	S3	2	80 ±0
p	Carex rosea	Rosy Sedge	S3	1	97 ±0
p	Carex eburnea	Bristle-leaved Sedge	S3	8	38 ±5
p	Verbena hastata	Blue Vervain	S3	6	46 ±0.1
p	Laportea canadensis	Canada Wood Nettle	S3	7	15 ±0
p	Limosella australis	Southern Mudwort	S3	5	53 ±5
p	Geocaulon lividum	Northern Comandra	S3	1	15 ±10
p	Salix petiolaris	Meadow Willow	S3	1	34 ±0
p	Galium kamtschaticum	Northern Wild Licorice	S3	6	51 ±1
p	Rosa palustris	Swamp Rose	S3	1	71 ±0
p	Agrimonia gryposepala	Hooked Agrimony	S3	16	16 ±0
p	Rhamnus alnifolia	Alder-leaved Buckthorn	S3	15	15 ±0
p	Ranunculus gmelinii	Gmelin's Water Buttercup	S3	6	39 ±0
p	Pyrola asarifolia	Pink Pyrola	S3	3	60 ±0
p	Primula laurentiana	Laurentian Primrose	S3	1	99 ±10
p	Polygonum scandens	Climbing False Buckwheat	S3	9	15 ±0
p	Polygonum pensylvanicum	Pennsylvania Smartweed	S3	7	15 ±0
p	Epilobium strictum	Downy Willowherb	S3	7	21 ±0.5
p	Epilobium hornemannii	Hornemann's Willowherb	S3	2	92 ±10
p	Decodon verticillatus	Swamp Loosestrife	S3	2	35 ±5
p	Utricularia radiata	Little Floating Bladderwort	S3	1	80 ±0
p	Teucrium canadense	Canada Germander	S3	5	28 ±0.1
p	Proserpinaca palustris var. crebra	Marsh Mermaidweed	S3	6	15 ±0
p	Proserpinaca palustris	Marsh Mermaidweed	S3	1	15 ±0
p	Bartonia virginica	Yellow Bartonia	S3	1	43 ±0.1
p	Stellaria longifolia	Long-leaved Starwort	S3	1	16 ±0
p	Campanula aparinoides	Marsh Bellflower	S3	7	48 ±5
p	Packera paupercula	Balsam Groundsel	S3	11	39 ±0
p	Megalodonta beckii	Water Beggarticks	S3	7	45 ±0.5
p	Erigeron hyssopifolius	Hyssop-leaved Fleabane	S3	8	50 ±0.1
p	Asclepias incarnata	Swamp Milkweed	S3	15	32 ±0
n	Collema furfuraceum	Blistered Tarpaper Lichen	S3?	1	66 ±10
n	Nephroma bellum	Naked Kidney Lichen	S3?	1	66 ±10
n	Sticta fuliginosa	Peppered Moon Lichen	S3?	1	74 ±0
p	Potamogeton praelongus	White-stemmed Pondweed	S3?	12	34 ±0.1
p	Elodea canadensis	Canada Waterweed	S3?	1	70 ±0
p	Carex cryptolepis	Hidden-scaled Sedge	S3?	1	55 ±0
p	Equisetum scirpoides	Dwarf Scouring-Rush	S3S4	5	51 ±1
p	Equisetum hyemale var. affine	Common Scouring-rush	S3S4	8	41 ±0
p	Equisetum hyemale	Common Scouring-rush	S3S4	1	52 ±0
p	Cystopteris bulbifera	Bulblet Bladder Fern	S3S4	18	5 ±1
p	Trisetum spicatum	Narrow False Oats	S3S4	2	55 ±0
p	Liparis loeselii	Loesel's Twayblade	S3S4	9	30 ±5
p	Luzula parviflora	Small-flowered Woodrush	S3S4	8	73 ±0
p	Juncus acuminatus	Sharp-fruited Rush	S3S4	1	46 ±0
p	Sisyrinchium angustifolium	Narrow-leaved Blue-eyed-grass	S3S4	15	16 ±1
p	Lindernia dubia	Yellow-seeded False Pimperel	S3S4	2	16 ±0
p	Polygonum robustius	Stout Smartweed	S3S4	3	16 ±0
p	Sanguinaria canadensis	Bloodroot	S3S4	22	16 ±0
p	Utricularia gibba	Humped Bladderwort	S3S4	1	41 ±10
p	Myriophyllum sibiricum	Siberian Water Milfoil	S3S4	1	61 ±0.1
p	Angelica atropurpurea	Purple-stemmed Angelica	S3S4	6	14 ±0
p	Eleocharis erythropoda	Red-stemmed Spikerush	SH	1	45 ±0
p	Solidago simplex var. randii	Sticky Goldenrod	SH	2	28 ±5

4.2 FAUNA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km
a	Sterna dougallii	Roseate Tern	S1B	Endangered	E	14	40 ±5
a	Charadrius melodus melodus	Piping Plover melodus ssp	S1B	Endangered	E	68	13 ±0.5
a	Calidris canutus rufa	Red Knot	S2S3M	Endangered	E	8	25 ±0.5
a	Myotis lucifugus	Little Brown Myotis	S1		E	17	26 ±10
a	Morone saxatilis	Striped Bass	S1		E,E,SC	4	38 ±10
a	Chaetura pelagica	Chimney Swift	S2S3B	Endangered	T	35	29 ±0.1
a	Chordeiles minor	Common Nighthawk	S3B	Threatened	T	48	3 ±5
a	Catharus bicknelli	Bicknell's Thrush	S1S2B	Vulnerable	T	7	43 ±5
a	Glyptemys insculpta	Wood Turtle	S3	Vulnerable	T	45	3 ±10

a	Acipenser oxyrinchus	Atlantic Sturgeon	S1?		T	1	89 ±10
a	Caprimulgus vociferus	Whip-Poor-Will	S1?B		T	2	39 ±5
a	Hylocichla mustelina	Wood Thrush	S1B		T	5	25 ±5
a	Wilsonia canadensis	Canada Warbler	S3B		T	84	3 ±5
a	Hirundo rustica	Barn Swallow	S3B		T	148	8 ±5
a	Contopus cooperi	Olive-sided Flycatcher	S3B		T	146	3 ±5
a	Dolichonyx oryzivorus	Bobolink	S3S4B		T	86	8 ±5
a	Histrionicus histrionicus pop. 1	Harlequin Duck - Eastern pop.	S2N	Endangered	SC	11	29 ±10
i	Lampsilis cariosa	Yellow Lampmussel	S1	Threatened	SC	1	100 ±0.1
a	Passerculus sandwichensis princeps	Savannah Sparrow princeps ssp	S1B		SC	1	64 ±5
a	Bucephala islandica (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	S1N		SC	2	94 ±0.1
a	Asio flammeus	Short-eared Owl	S1S2		SC	1	78 ±5
i	Alasmidonta varicosa	Brook Floater	S1S2		SC	6	28 ±0.1
i	Danaus plexippus	Monarch	S2B		SC	4	50 ±1
a	Euphagus carolinus	Rusty Blackbird	S2S3B		SC	57	8 ±5
a	Contopus virens	Eastern Wood-Pewee	S3S4B		SC	81	3 ±5
a	Chelydra serpentina	Snapping Turtle	S5		SC	8	38 ±0.1
a	Puma concolor pop. 1	Cougar - Eastern pop.	SH		DD	34	12 ±1
a	Lynx canadensis	Canadian Lynx	S1	Endangered	NAR	17	23 ±1
a	Sorex dispar	Long-tailed Shrew	S1		NAR	5	53 ±10
a	Aegolius funereus	Boreal Owl	S1B		NAR	1	29 ±0.1
a	Hemidactylium scutatum	Four-toed Salamander	S3		NAR	16	3 ±10
a	Sialia sialis	Eastern Bluebird	S3B		NAR	6	11 ±5
a	Sterna hirundo	Common Tern	S3B		NAR	124	3 ±5
a	Gavia immer	Common Loon	S3B,S4N		NAR	207	3 ±5
a	Accipiter gentilis	Northern Goshawk	S3S4		NAR	30	29 ±5
a	Alces americanus	Moose	S1	Endangered		18	44 ±10
a	Martes americana	American Marten	S1	Endangered		10	57 ±10
i	Leptodea ochracea	Tidewater Mucket	S1			1	98 ±10
i	Coenagrion interrogatum	Subarctic Bluet	S1			1	95 ±0.1
i	Somatochlora williamsoni	Williamson's Emerald	S1			2	80 ±0.1
i	Ophiogomphus mainensis	Maine Snaketail	S1			1	56 ±0.1
i	Ophiogomphus aspersus	Brook Snaketail	S1			3	20 ±0.1
i	Polygonia gracilis	Hoary Comma	S1			2	76 ±1
i	Lycaena dorcas	Dorcas Copper	S1			4	56 ±0.5
a	Vireo gilvus	Warbling Vireo	S1?B			5	18 ±5
a	Toxostoma rufum	Brown Thrasher	S1?B			1	98 ±5
a	Tringa solitaria	Solitary Sandpiper	S1?B,S4S5M			2	37 ±0.1
a	Progne subis	Purple Martin	S1B			1	79 ±0.5
a	Nycticorax nycticorax	Black-crowned Night-heron	S1B			1	39 ±5
a	Alca torda	Razorbill	S1B,S4N			2	83 ±5
a	Calidris minutilla	Least Sandpiper	S1B,S5M			20	16 ±0.5
a	Larus delawarensis	Ring-billed Gull	S1B,S5N			6	58 ±0.1
a	Picoides dorsalis	American Three-toed Woodpecker	S1S2			4	39 ±5
i	Nymphalis vaualbum j-album	Compton Tortoiseshell	S1S2			1	50 ±1
i	Papilio brevicauda	Short-tailed Swallowtail	S1S2			3	74 ±10
a	Passerina cyanea	Indigo Bunting	S1S2B			1	29 ±5
a	Charadrius semipalmatus	Semipalmated Plover	S1S2B,S5M			27	16 ±0.5
a	Martes pennanti	Fisher	S2			1	79 ±10
a	Microtus chrotorrhinus	Rock Vole	S2			3	53 ±10
a	Salmo salar	Atlantic Salmon	S2			63	13 ±10
a	Asio otus	Long-eared Owl	S2			5	19 ±5
i	Lampsilis radiata	Eastern Lampmussel	S2			18	13 ±0.1
i	Somatochlora septentrionalis	Muskeg Emerald	S2			3	76 ±0.1
i	Somatochlora forcipata	Forcipate Emerald	S2			3	68 ±1
i	Gomphus descriptus	Harpoon Clubtail	S2			7	20 ±0.1
i	Aglais milberti	Milbert's Tortoiseshell	S2			1	76 ±1
i	Boloria chariclea	Arctic Fritillary	S2			1	82 ±0.1
i	Satyrium calanus	Banded Hairstreak	S2			1	70 ±0.1
i	Lycaena dospassosi	Maritime Copper	S2			1	49 ±0.1
i	Pieris oleracea	Mustard White	S2			19	31 ±0.1
i	Thorybes pylades	Northern Cloudywing	S2			4	32 ±0
a	Vireo philadelphicus	Philadelphia Vireo	S2?B			2	48 ±5
a	Piranga olivacea	Scarlet Tanager	S2B			4	46 ±5
a	Empidonax traillii	Willow Flycatcher	S2B			1	83 ±5
a	Cepphus grylle	Black Guillemot	S2B			20	28 ±5
a	Rallus limicola	Virginia Rail	S2B			3	19 ±5
a	Anas acuta	Northern Pintail	S2B			3	28 ±10
a	Phalacrocorax carbo	Great Cormorant	S2B			29	38 ±0.5
i	Pantala hymenaea	Spot-Winged Glider	S2B			2	70 ±1
a	Rissa tridactyla	Black-legged Kittiwake	S2B,S4S5N			1	94 ±0.5
a	Bucephala clangula	Common Goldeneye	S2B,S5N			33	8 ±5
i	Alasmidonta undulata	Triangle Floater	S2S3			3	34 ±0.1
i	Erynnis juvenalis	Juvenal's Duskywing	S2S3			1	42 ±1
a	Icterus galbula	Baltimore Oriole	S2S3B			12	3 ±5
a	Molothrus ater	Brown-headed Cowbird	S2S3B			25	13 ±5
a	Pooecetes gramineus	Vesper Sparrow	S2S3B			5	18 ±5
a	Tringa semipalmata	Willet	S2S3B			80	3 ±5
a	Poecile hudsonica	Boreal Chickadee	S3			162	3 ±5
i	Amphiagrion saucium	Eastern Red Damsel	S3			4	37 ±0.1
i	Sympetrum danae	Black Meadowhawk	S3			8	15 ±0.1
i	Nannothemis bella	Elfin Skimmer	S3			2	8 ±0.1
i	Somatochlora tenebrosa	Clamp-Tipped Emerald	S3			2	90 ±0.1
i	Gomphaeschna furcillata	Harlequin Darner	S3			2	8 ±0.1
i	Boyeria grafiana	Ocellated Darner	S3			2	89 ±1
i	Aeshna clepsydra	Mottled Darner	S3			2	7 ±0.1

i	Ophiogomphus carolus	Riffle Snaketail	S3	23	13 ±0.1
i	Lanthus parvulus	Northern Pygmy Clubtail	S3	11	32 ±1
i	Oeneis jutta	Jutta Arctic	S3	2	37 ±0
i	Polygonia faunus	Green Comma	S3	9	32 ±0.1
i	Euphydryas phaeton	Baltimore Checkerspot	S3	6	30 ±1
i	Hesperia comma laurentina	Laurentian Skipper	S3	3	50 ±1
i	Hesperia comma	Common Branded Skipper	S3	12	50 ±1
a	Dendroica tigrina	Cape May Warbler	S3?B	22	8 ±5
a	Coccyzus erythropthalmus	Black-billed Cuckoo	S3?B	21	25 ±5
a	Pinicola enucleator	Pine Grosbeak	S3?B,S5N	51	11 ±5
a	Mimus polyglottos	Northern Mockingbird	S3B	11	3 ±5
a	Dumetella carolinensis	Gray Catbird	S3B	50	3 ±5
a	Petrochelidon pyrrhonota	Cliff Swallow	S3B	58	8 ±5
a	Riparia riparia	Bank Swallow	S3B	82	11 ±5
a	Sterna paradisaea	Arctic Tern	S3B	34	14 ±5
a	Anas discors	Blue-winged Teal	S3B	45	15 ±5
a	Podilymbus podiceps	Pied-billed Grebe	S3B	22	18 ±5
i	Polygonia interrogationis	Question Mark	S3B	2	50 ±1
a	Tringa melanoleuca	Greater Yellowlegs	S3B,S5M	40	16 ±0.5
a	Mergus serrator	Red-breasted Merganser	S3B,S5N	47	8 ±5
a	Calidris pusilla	Semipalmated Sandpiper	S3M	21	16 ±0.5
a	Limosa haemastica	Hudsonian Godwit	S3M	4	38 ±0.5
a	Numenius phaeopus hudsonicus	Hudsonian Whimbrel	S3M	3	37 ±10
a	Pluvialis dominica	American Golden-Plover	S3M	8	38 ±0.5
a	Branta bernicla	Brant	S3M	1	29 ±10
a	Calidris maritima	Purple Sandpiper	S3N	11	8 ±10
a	Synaptomys cooperi	Southern Bog Lemming	S3S4	2	53 ±10
a	Cardinalis cardinalis	Northern Cardinal	S3S4	4	53 ±5
a	Perisoreus canadensis	Gray Jay	S3S4	107	3 ±5
a	Picoides arcticus	Black-backed Woodpecker	S3S4	27	14 ±0.5
i	Polygonia progne	Grey Comma	S3S4	10	38 ±0
i	Speyeria aphrodite	Aphrodite Fritillary	S3S4	1	37 ±1
i	Callophrys polios	Hoary Elfin	S3S4	2	29 ±1
i	Satyrium liparops	Striped Hairstreak	S3S4	1	69 ±0.1
a	Passerella iliaca	Fox Sparrow	S3S4B	36	11 ±5
a	Pheucticus ludovicianus	Rose-breasted Grosbeak	S3S4B	64	8 ±5
a	Wilsonia pusilla	Wilson's Warbler	S3S4B	29	3 ±5
a	Dendroica striata	Blackpoll Warbler	S3S4B	36	3 ±5
a	Dendroica castanea	Bay-breasted Warbler	S3S4B	82	3 ±5
a	Vermivora peregrina	Tennessee Warbler	S3S4B	57	3 ±5
a	Tyrannus tyrannus	Eastern Kingbird	S3S4B	39	3 ±5
a	Sayornis phoebe	Eastern Phoebe	S3S4B	14	3 ±5
a	Empidonax flaviventris	Yellow-bellied Flycatcher	S3S4B	168	3 ±5
a	Gallinago delicata	Wilson's Snipe	S3S4B	41	28 ±5
a	Actitis macularius	Spotted Sandpiper	S3S4B	167	3 ±5
a	Charadrius vociferus	Killdeer	S3S4B	55	3 ±5
a	Botaurus lentiginosus	American Bittern	S3S4B	38	3 ±5
a	Carduelis pinus	Pine Siskin	S3S4B,S5N	98	3 ±5
a	Morus bassanus	Northern Gannet	SHB,S5M	6	15 ±0.5

4.3 RANGE MAPS

The legally protected taxa listed below are linked to the study area by predictive range maps based upon expert estimates of distribution. Taxa listed here but not in the observation data above, are unknown within the study area but perhaps present. Ranges of rank 1 indicate possible occurrence, those of rank 2 and 3 increasingly less probable.

	scientific name	common name	prov. rarity	prov. status	COSEWIC	range
a	Glyptemys insculpta	Wood Turtle	S3	Vulnerable	T	1
p	Listera australis	Southern Twayblade	S2			1
p	Isoetes prototypus	Prototype Quillwort	S2	Vulnerable	SC	1
n	Erioderma pedicellatum	Boreal Felt Lichen (Atlantic pop.)	S1S2	Endangered	E	2
p	Eriocaulon parkeri	Parker's Pipewort			NAR	2

5.0 SOURCE BIBLIOGRAPHY

The recipient of this data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

recs	source
1799	Lepage, D. 2009. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 143,498 recs.
816	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
203	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
193	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
152	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
152	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
126	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
120	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
114	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
83	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
71	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
66	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
65	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
62	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
54	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
47	Blaney, C.S & Spicer, C.D.; Popma, T.M.; Basquill, S.P. 2003. Vascular Plant Surveys of Northumberland Strait Rivers & Amherst Area Peatlands. Nova Scotia Museum Research Grant, 501 recs.
43	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
42	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
41	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
39	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
33	Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor couguar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
31	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
31	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
28	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
19	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
19	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
16	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
16	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
15	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 293 recs.
13	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
13	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
13	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
12	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 717 recs.
10	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
10	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
9	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
8	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
7	"Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs."
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
5	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
5	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
5	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
5	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
4	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Benjamin, L.K. (compiler). 2002. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 32 spp, 683 recs.
4	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
4	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
4	NSDNR. 2007. Restricted & Limited Use Land Database (RLUL).
3	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
3	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
3	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
3	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
3	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
3	Baechler, Lynn. 2012. Plant observations & photos, 2012. Pers. comm. to S. Blaney, July 2012, 4 recs.
2	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
2	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
2	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
2	Daury, R.W. & Bateman, M.C. 1996. The Barrow's Goldeneye (Bucephala islandica) in the Atlantic Provinces and Maine. Canadian Wildlife Service, Sackville, 47pp.
2	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
2	Bridgland, J. 2006. Cape Breton Highlands National Park Digital Database. Parks Canada, 190 recs.

2 Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.
1 Whittam, R.M. 2000. Senecio pseudoarnica on Country Island. , Pers. comm. to S. Gerriets. 1 rec.
1 Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
1 Robinson, C.B. 1907. Early intervale flora of eastern Nova Scotia. Transactions of the Nova Scotia Institute of Science, 10:502-506. 1 rec.
1 Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
1 Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
1 Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
1 Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
1 Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
1 Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
1 Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1 Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
1 Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1 Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1 Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
1 Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
1 Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
1 Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1 Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
1 Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
1 Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.

Appendix D:

Avian field survey for Celtic Current:

Mulgrave Turbine Site

(David Johnston, 2013)

207 Hiram Street,
Port Hawkesbury, N.S.
B9A 2C3
February 8, 2013

Peter Archibald
Celtic Current Inc
P.O. Box 130
Port Hood, N.S.
B0E 2W0

Dear Peter:
Enclosed please find my final report and final invoice for the avian survey for the Mulgrave Turbine site. If you determine that more is needed to fulfill the environmental assessment requirements (as per our telephone discussion on January 24), I can make additional visits and rewrite the report or add an addendum to the enclosed report. I do believe, however, that the enclosed report reflects the bird population and bird use of the site.
Please note that I have all of the raw data for each visit on file as well as the enclosed report and can provide any part of it to you via e-mail at your request.
Thank you for the opportunity to carry out this project.

Yours truly,

David Johnston

AVIAN FIELD SURVEY
FOR CELTIC CURRENT MULGRAVE TURBINE SITE

An avian field survey was carried out on the Celtic Current site (Mulgrave Turbine site) during the year 2012 and the winter of 2013. The survey was undertaken as part of the requirements for the installation of wind turbines to produce electric power. The field survey was designed to cover an annual cycle including the avian spring migration period, the summer breeding season, the fall migration period and the winter season. The purpose of the survey was to determine what species of birds were using the site over a yearly cycle and to provide breeding evidence of species identified. The survey was started in May, 2012 and completed in January, 2013.

Site Description and Survey Design:

The original field survey proposal was for a study comprising only one turbine but soon after the original study design had been completed, it became clear that up to three turbines might be erected. **Figure 1**: ***Proposed 3 Turbine Layout*** became available and clearly indicated the possible location of three turbines. An area approximately 130 meters square, had already been cleared and prepared for possible erection of the first turbine (Turbine 1) prior to the beginning of the field work. A meteorological tower was in place on the cleared area to collect wind data. The original study design, therefore, was modified to include the other two proposed turbine sites (Turbine 2 and Turbine 3). The Mulgrave Turbine site is a relatively small area, approximately 1500 meters long and 500 meters wide, situated on a hardwood ridge near the Town of Mulgrave and just to the southwest of Morrison's Lake. The Mulgrave Turbine site does not include much habitat diversity. There are very few coniferous trees and the hardwood has been aggressively cut over in the past. There is some sign of old, grown-up pastureland and there is a significant treed bog area near the proposed Turbine 3 site. The result is a site with virtually identical habitat in the locations chosen for the field study. Further data on habitat structure can be found in **Appendix 1, Description of Point Count Stations.**

Study Design:

The field study was designed based on an Environment Canada (Canadian Wildlife Service) guide entitled *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds, April, 2007.* The *Recommended Protocols* were followed as closely as practically possible with exceptions being noted in the discussion of results. The study was designed to include two search procedures: Point Counts and Area Searches. Locations within or near the Mulgrave Turbine site were chosen for conducting point counts. These point count stations were chosen at varying distances from the three proposed turbine locations and area searches were planned for the areas leading to each point count station.

Point Count Procedure:

Appendix 1, Description of Point Count Stations, provides a brief description of the nine sites chosen for point count stations. The appendix includes GPS location readings for each station as well as elevation data. Ten minute point counts were carried out at these nine stations during most of the visits. Each point count was performed by observing bird species and listening for bird calls for ten minutes. The time of day was noted at the beginning of each point count and all species observed or heard were recorded. The species found were noted to be within 0 to 50 meters, 50 to 100 meters or more distant than 100 meters from the point count location. Fly over observances, birds flying over the site while the point count was in progress, were recorded by the estimated height they were flying – within 50 meters, between 50 and 100 meters or above100 meters. Once the ten minute observance, listening period was completed, audio playback of selected bird calls and/or mobbing calls were

sometimes used to help confirm a species that had been inadequately identified during the ten minute period.

Area Search Procedure:
The areas walked over to get to the nine point count stations were designated as the search areas. All species observed or heard while slowly walking to each point count site were recorded and again, the estimated distance to the observation was noted as 0 to 50 meters, 50 to 100 meters or greater than 100 meters. Fly over observances were again recorded as in the point counts. Audio playback was used in instances similar to the point count procedures to aid in identifying some species. For both procedures, optical equipment used was Eagle Optics Ranger binoculars, 8x42mm.

Periods for Field Studies: Four distinct periods of study were used as advocated in the Environment Canada Protocols:

Spring Migration	– March through May	Two surveys weekly
Nesting Period	– June through August	One survey weekly
Fall Migration	– September through October	Two surveys weekly
Winter period	– December through February	One survey monthly

The recommended frequency of visits during each period is shown. These frequencies were not comprehensively followed. This decision is explained further in the Survey Results section.

Survey Results:
Table 1, List of Site Visits and Weather Data, provides a list of all visits made during the field study with relevant weather data. A total of 25 visits were made to the site. Weather data was collected based on personal observation and from data provided from the Environment Canada Weather website. The weather station used is located at Tracadie, N.S., 20 km west of the Mulgrave Turbine site.
Table 2, List Of Species And Breeding Evidence, details the species list and breeding evidence built up for the Mulgrave Turbine site for the entire survey with appropriate comments. In addition to the species list table, an estimate of abundance is included in the report for three of the four survey periods. The abundance estimate is based on the actual number of each species counted during each visit, accumulated over the total number of visits. Some birds would be counted more than once on subsequent visits but the procedure should provide a reasonable abundance estimate and add additional confidence that these species were nesting within or near the site.
Spring Migration, May,2012:
The Spring Migration period of the survey calls for twice weekly visits from March through May. Since this survey did not commence until May 15, a considerable portion of the spring migration was not covered. It is believed, however, that the survey results will indicate that data gathered during the shortened spring period adequately reflects the spring migration period for the site.
Significant numbers of migrating species were observed within the site during the May visits. The lack of diverse habitat may not offer many obvious migrant traps (i.e. food, water), but the existing habitat does provide breeding opportunities for a number of native species. Obvious spring migrants following long flight paths in closely maintained groups and/or outside their normal nesting habitat were not observed during the visits with the exception of a flock of 24 Blue Jays observed on May 15. These birds were thought to have been moving into territory for the breeding season from their winter habitat. Abundance estimates for the Spring Migration period, in descending order of abundance are:

White-throated Sparrow
Magnolia Warbler
Ovenbird

Abundance Estimate Continued:

Black and White Warbler
Blue Jay
Hermit Thrush
American Robin
Red-eyed Vireo
Black-capped Chickadee
American Goldfinch

Nesting Period, June 1 – August 31:

Ten visits were made during the nesting period. The number of birds observed using the site decreased as the spring/summer period progressed into the breeding season. Some of the migrants moved on or spread out over adjacent territory to begin nesting. Breeding evidence is recorded for each species found following procedures used in the Maritimes Breeding Bird Atlas, 2006 – 2010. With the concentrated number of visits during the breeding period, it was possible to establish permanent breeding territory or higher evidence for most species. Since the surveyed site is a relatively small part of the surrounding area, it is not possible, however, to actually confirm that all species listed were actually nesting within the confines of the site. The breeding codes recorded in Table 2 are explained at the bottom of the table.

All of the species identified with high breeding evidence are native species expected to be found in this area and within the type of habitat associated with and surrounding the project area. Abundance estimates are provided along with the breeding evidence. Abundance estimates for the Nesting Period and the associated breeding code, in descending order of abundance are:

Red-eyed Vireo	FY	(Recently fledged young)
White-throated Sparrow	CF	(Adult carrying food for young)
Magnolia Warbler	A	(Agitated behaviour or anxiety calls of an adult)
American Robin	CF	(Adult carrying food for young)
Hermit Thrush	CF	(Adult carrying food for young)
Cedar Waxwing	P	(Pair observed in suitable nesting habitat)
American Goldfinch	T	(Permanent territory presumed, observed 1 week apart)
Ovenbird	T	(Permanent territory presumed, observed 1 week apart)
Swainson's Thrush	T	(Permanent territory presumed, observed 1 week apart)
Duck species	X	(Species observed, – no evidence of breeding.)
Dark-eyed Junco	A	(Agitated behaviour or anxiety calls of an adult)

The Duck species is included in the abundance estimate since significant numbers of ducks were observed flying over the site during this period. There was no evidence,however,of ducks nesting within the site. More comments are made on these observances under the heading "Flyovers"

The number of species observed as the end of the nesting season approached dropped off dramatically with very few observances on the last two visits in August. This led to the decision to reduce the number of point counts for the last two visits of the Nesting Period (August 16 and 31).

Fall Migration, September1 – October 31 ,2012:

No point counts were planned for the Winter Period visits in the original design and, as a matter of practically, this procedure was extended to include the Fall Migration period. Here, based on the dramatic drop in species observed toward the end of the Nesting Period, is was felt that the area searches alone would adequately provide evidence of avian use of the site during the fall. Further, the number of visits planned for the Fall Migration period was reduced from twice weekly to once weekly. There was an obvious influx of a few species of migrating birds, especially identified warblers and

unidentified warbler species but this didn't add a significant number of individuals. Abundance estimates for the Fall Migration, in descending order of abundance are:

Identified warblers and Unidentified Warbler Species
Black-capped Chickadee
Dark-eyed Junco
American Goldfinch
American Crow
White-throated Sparrow
Red-eyed Vireo
Blue Jay
American Robin

The Warbler influx far outnumbered all other species during this period with Magnolia Warbler being the most numerous. Most of these warblers were found in small flocks and were obviously migrating or preparing to migrate. As noted in the Spring Migration comments, the lack of diverse habitat does not offer many obvious migrant traps for significant numbers of birds.The ducks observed flying over late in the nesting season could have been part of the beginning of the fall migration.

Winter Period, November 1, 2012 – February 28, 2013:

One visit per month is required in the protocols during the winter period. No visit was made in February following visits in November, December and January. Very few birds were found during area searches in this winter period. That is, a total of 34 individuals were the only birds found on the three visits. Obviously, there are few species or individuals using the site during the winter.

Flyovers:

Birds observed flying over the site during all area searches and point counts were recorded. These observances are noted in the comments section of Table 2. Ducks and Common Loons were observed occasionally throughout the survey. There are a number of small isolated lakes in the vicinity of the site and also the larger Morrison's Lake. The proximity of the Strait of Canso provided the occasional high flying Herring Gulls, Double-crested Cormorants and Great Blue Heron. However, the site is not on a flyway for migrating sea birds.

The only hawk type birds flying over the site with any frequency was a Sharp-shinned Hawk. A Merlin was sighted once. One Killdeer was observed flying over the meteorological tower on May 15 and was not seen again. Bald Eagles and Red-tailed Hawks were occasionally seen in the vicinity of Morrison's Lake but not over the turbine site. Ravens and Crows were quite frequently seen flying over the site as were Woodpeckers.

The largest flock seen flying over was the flock of 24 Blue Jays mentioned in the Spring Migration section. Almost all of these birds moved through the site. Small birds such as Cedar Waxwings and songbirds were occasionally seen in flight. A dead Blackburnian Warbler was found under the meteorological tower on May 29. It is assumed this bird collided with one of the tower guy wires.

Species of Conservation Interest:

Two species of conservation interest were found during the survey. The Olive-sided Flycatcher is designated as "threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The second bird, the Eastern Wood-Pewee, is designated by COSEWIC as a species of "special concern" and may eventually be listed as "threatened".

Olive-sided Flycatchers were observed or heard only in August and there is no evidence of breeding within the site. On August 3, Olive-sided Flycatchers (5 birds) were observed in the treed bog area near

the proposed Turbine 3 site. These were birds with recently fledged young that had moved into this wet area to feed in preparation for migration. The same or other Olive-sided Flycatchers were heard at a distance on August 3 and 16.
Only one Eastern Wood-Pewee was found; again in the wet area near the proposed Turbine 3 site. This bird was probably also feeding here and there was no evidence of nesting. The habitat within the site is not attractive nesting habitat for either of these species.

Final Conclusions:
The Celtic Current Mulgrave Turbine site was found to hold species expected to be found in the habitat provided but were not found in large numbers. A small influx of migrating birds was evident in both the spring and fall and a there was evidence that a considerable number of native species were nesting within or near the site. Birds observed flying over the site were not found in large numbers and did not represent a large number of birds on migration. The site does not provide attractive habitat for overwintering birds.
The two species of conservation interest found were found after the breeding season and were concluded to be using the site while preparing for the fall migration.

Table 1 **MULGRAVE TURBINE AVIAN SURVEY**

List of Site Visits and Weather Data

Date	Time	Temp. °C	Wind Direction (°)	Wind Speed km/hr	Weather Conditions
May 15	6:00a.m. - 9:30a.m.	13.0 – 18.5	20° – 23°	24 - 20	Partly sunny
May 18	6:15a.m. – 10:00a.m.	7.0 – 13.2	26° – 28°	11 - 20	Sunny
May 21	5:00p.m. - 8:15p.m.	23.5 – 18.1	22° – 21°	30 - 13	Sunny, breezy
May 25	5:45a.m. - 9:30a.m.	7.2 – 14.1	3° – 19°	4 - 15	Sunny, light cloud
May 29	5:45a.m. - 9:15a.m.	4.4 – 8.0	7° – 6°	6 - 9	70% cloud
June 1	5:45a.m. – 9:00a.m.	9.1 – 9.8	27° –32°	7 - 20	Cloudy, light drizzle
June 12	5:45a.m. – 9:00a.m.	8.3 – 16.3	5° – 12°	2 - 11	Fog, clearing, part sun
June 18	5:15p.m. - 8:30p.m.	16.7 – 10.1	13° – 15°	13 - 7	Sunny, breezy
June 26	5:30a.m. - 9:00a.m.	14.4 – 16.8	11° – 13°	9 - 20	Overcast, fog, breezy
July 03	5:30a.m. - 9:00a.m.	15.2 – 22.0	15° – 32°	6 - 4	Sunny, warm
July 13	5:30a.m. - 9:15a.m.	16.7 – 22.6	22° – 26°	19 - 13	Sunny, warm
July 26	5:30p.m. - 8:45p.m.	25.6 – 19.4	28° – 21°	13 - 13	Hot and breezy
Aug. 3	5:15a.m. - 9:00a.m.	17.2 – 20.7	21° – 22°	6 - 9	Partly sunny
Aug.16	5:45a.m. - 8:45a.m.	18.8 – 21.6	15° – 14°	9 - 13	Overcast, slight breeze
Aug. 31	6:00a.m. - 8:45a.m.	16.5 – 21.1	19° – 22°	32 - 30	Partly cloudy, windy
Sept. 05	6:30a.m. - 8:45a.m.	16.5 – 13.2	20° – 25°	11 - 7	Overcast, then rain
Sept. 13	6:45a.m. – 9:15a.m.	15.2 – 18.3	20° – 21°	15 - 15	Sunny, calm
Sept. 19	6:45a.m. – 9:00a.m.	17.1 – 19.4	17° – 17°	26 - 32	Partly cloudy, windy
Sept. 26	7:00a.m. - 9:45a.m.	12.9 – 17.1	20° – 22°	22 - 20	Partly cloudy, breezy
Oct. 01	12:30p.m. - 3:00p.m.	19.0 – 19.1	20° – 20°	17 - 17	Partly cloudy, calm
Oct. 10	7:30a.m. - 10:00a.m.	10.5 – 12.3	9° – 10°	11 - 19	Partly cloudy
Oct. 19	8:00a.m. - 10:30a.m.	9.7 – 14.0	21° – 21°	9 - 7	Sunny, warm, calm
Nov. 19	1:00p.m. – 2:45p.m.	4.5 – 4.0	28° – 2°	9 - 4	Sunny, cool, calm
Dec 14	8:30a.m. - 10:30a.m	-4.0 – 0.0	21° – 21°	15 - 15	Partly cloudy, calm
Jan.12'13	8:30a.m. - 10:45a.m	-4.0 – -1.0	35° – 36°	20 - 20	Partly cloudy, breezy

Table 2

MULGRAVE TURBINE AVIAN FIELD SURVEY
LIST OF SPECIES AND BREEDING EVIDENCE

Species	Breeding Evidence	Comments
Canada Goose	X	
American Black Duck	X	Fly over (100) near Turb.3 - Aug. 16
Duck species	X	Fly over (100) at pc 4 – May 15, at pc1,3,9 – Aug. 3,16
Ruffed Grouse	FY	Near PC 1, also seen at other locations
Common Loon	X	Fly over (100m) at pc1– July 13, 2 at pc8,9 Sept.13
Double-crested Cormorant	X	2Fly over (100m) at pc1 – July 3
Great Blue Heron	X	Fly over (100m) May 29,July 3, July13
Bald Eagle	X	2 Fly over (50m) east of Turbine I, Junel
Sharp-shinned Hawk	X	Fly over (50 m.) near Turb.3 Aug. 16, near Turb. 1 Sept. 13
Red-tailed Hawk	X	2 Fly over (100m) east of Turbine 1, Junel
Merlin	H	Fly over (50 m.) at pc6 – May 21
Killdeer	H	Fly over at Turbine 1 (100m) – May15
American Woodcock	T	At pc9 and pc5
Herring Gull	X	Fly over (100) Multiple, various locations- July, Aug., Jan.
Barred Owl	X	Heard distant – south of Turbine 1 and north of Turbine 3
Ruby-throated Hummingbird	T	At pc 9
Downy Woodpecker	H	
Hairy Woodpecker	T	
Northern Flicker	T	
Pileated Woodpecker	T	Fly over(50 m) T.1 -May 25,29, June 12, at pc2 – July 13
Woodpecker species	X	2 Fly over (50) at pc5 – June 12
Olive-sided Flycatcher	X	Several locations in August (migration) *
Eastern Wood-Pewee	X	In swampy area near Turbine 3, Aug.16 (migration) *
Alder Flycatcher	T	
Blue-headed Vireo	A	
Red-eyed Vireo	FY	
Grey Jay	X	Winter Survey
Blue Jay	T	24 Fly over (50) May 15, 3 at pc8,9 Aug.16
American Crow	H	Fly over (50 -100) Multiple,various locations-May – Jan.'13
Common Raven	X	Fly over (50m) Aug.16, Sept.26, 2,Oct.01(50), Oct. 19(100)
Black-capped Chickadee	T	
Boreal Chickadee	H	
Golden-crowned Kinglet	H	
Ruby-crowned Kinglet	T	
Swainson's Thrush	T	
Hermit Thrush	CF	
American Robin	CF	

Cedar Waxwing	P	Fly over (50 m) multiple, various locations – June & July
Nashville Warbler	S	
Northern Parula	T	
Magnolia Warbler	A	
Yellow-rumped Warbler	T	
Black-th. Green Warbler	T	
Blackburnian Warbler	S	
Palm Warbler	X	Fall migration
Black & White Warbler	CF	
American Redstart	P	
Ovenbird	T	
Northern Waterthrush	P	In swampy area near Turbine 3
Morning Warbler	A	
Common Yellowthroat	T	
Warbler species	X	Fall migration
Song Sparrow	X	
White-throated Sparrow	CF	
Dark-eyed Junco	A	
Common Grackle	X	Fall migration
Purple Finch	T	
American Goldfinch	T	7 Fly over (50m) Sept. 26

Notes:
X = Species observed, no evidence of breeding.
H = Observed in appropriate breeding habitat
S = Singing in appropriate breeding habitat
P = Pair observed in suitable nesting habitat
T = Permanent territory presumed, i.e., observed or heard in the same location on visits one week apart
D = Courtship or display, including interaction between a male and a female
A = Agitated behaviour or anxiety calls of an adult
DD = Distraction display or injury feigning
FY = Recently fledged young
AE = Adult leaving or entering nest sites
CF = Adult carrying food for young

* Designated by COSEWIC: Committee on the Status of Endangered Wildlife in Canada as a species of concern

Appendix 1

AVIAN MONITORING FOR MULGRAVE WIND TURBINE
DESCRIPTION OF POINT COUNT STATIONS

Point Count 1: UTM Easting 621720 UTM Northing 5052975
Elevation: 120 meters. Located 350 meters east of Turbine 1 on edge of trail leading to potential turbine sites 2 and 3. Scrubby, young deciduous area that has been cut over. Drops off to the east to a low, wet area.

Point Count 2: UTM Easting 621876 UTM Northing 5052947
Elevation: 120 meters. Located 230 meters east of Turbine 1. This point count site is 50 meters off of the trail (south) leading to potential turbine sites 2 and 3. Young deciduous growth.

Point Count 3: UTM Easting 621980 UTM Northing 5053355
Elevation: 110 meters. Located 280 meters north of Turbine 1 on edge of trail leading north to abandoned rail bed. Old, grown up pastureland. Young deciduous growth with a few mature deciduous trees. Very few coniferous trees.

Point count 4: UTM Easting 621954 UTM Northing 5053183
Elevation: 125 meters. Located 150 meters north of Turbine 1 on edge of trail leading north to abandoned rail bed. Old, grown up pastureland. Young deciduous growth with a few scattered older coniferous trees.

Point count 5: UTM Easting 622037 UTM Northing 5053022
Elevation: 130 meters. This station is on the south edge of the clearing (approximately 130m x 130m)on which the meteorological tower is located. The clearing is the proposed location for Turbine 1. The point count station is on the edge of a significant down slope which allows for an efficient survey of a large area which is at a lower elevation than the turbine site. The station also allows a full survey of the cleared site.

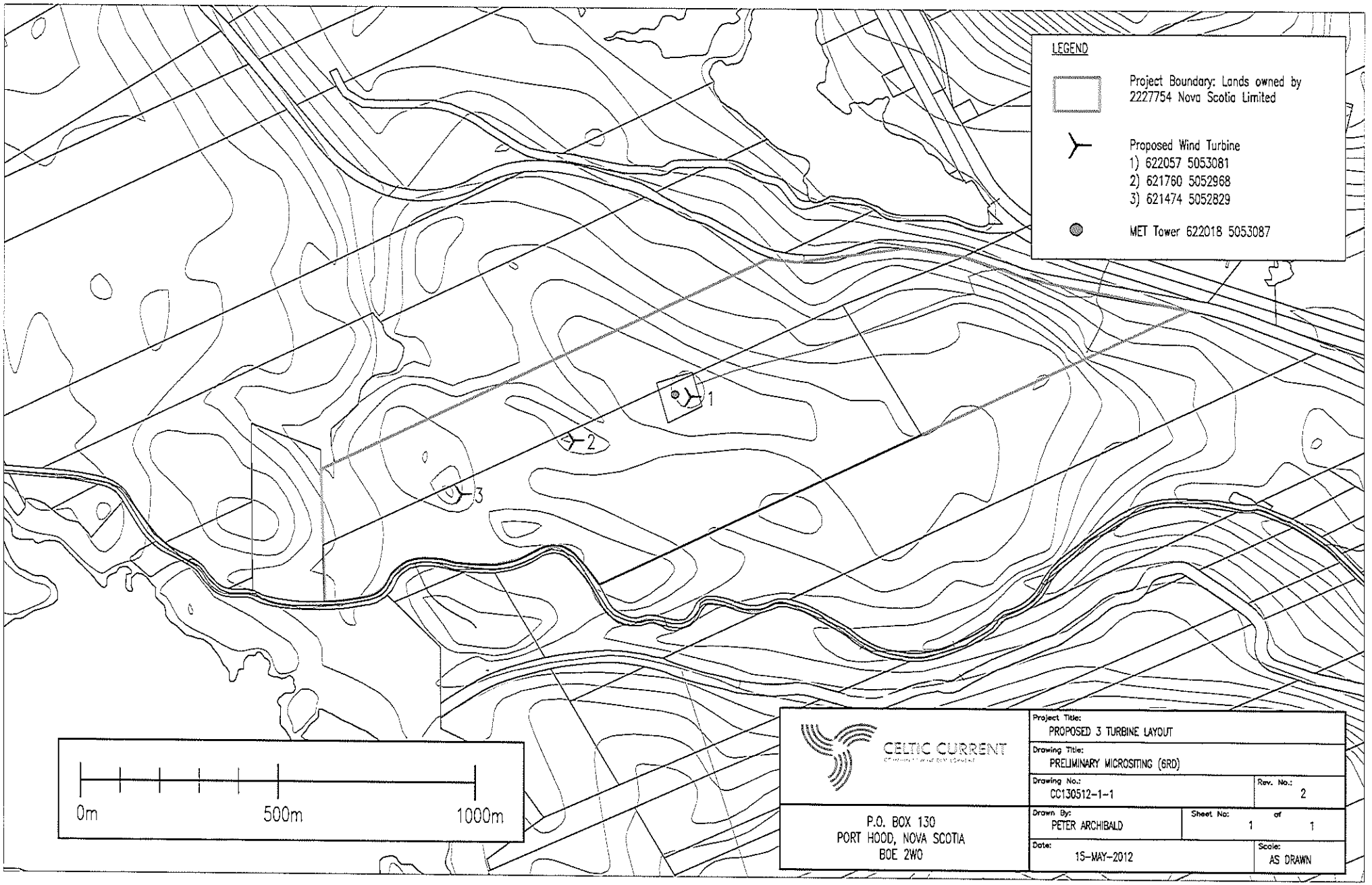
Point count 6: UTM Easting 622247 UTM Northing 5053164
Elevation: 120 meters. Located 240 meters east of Turbine 1 on the edge of the new gravel road leading from highway 344 to the turbine site. Mature deciduous trees on north side of the road and young deciduous and young coniferous trees on the south side.

Point count 7: UTM Easting 622428 UTM Northing 5053177
Elevation: 110 meters. Located 415 meters east of Turbine 1 and 100 meters off of the new gravel road (south) leading from highway 344 to the turbine site. Wooded area of mature deciduous trees and a very small brook.

Point count 8: UTM Easting 621611 UTM Northing 5052876
Elevation: 115 meters. Located on the trail leading west from Turbine 1, 150 meters east of potential Turbine 3 site and 490 meters from Turbine 1. Cutover area with growth of young deciduous trees.

Point count 9: UTM Easting 621477 UTM Northing 5052900
Elevation: 125 meters. Located 590 meters west of Turbine 1 and 70 meters from the potential Turbine 3 site. Brushy, bushy cutover area with a few conifers and a few mature deciduous trees. This point count site is also near a significant treed bog wet area which is just south of the potential site for Turbine 3.

NOTE: Morrison's Lake is 925 meters northeast of Turbine 1.



CELTIC CURRENT

P.O. BOX 130
PORT HOOD, NOVA SCOTIA
B0E 2W0

Project Title: PROPOSED 3 TURBINE LAYOUT	
Drawing Title: PRELIMINARY MICROSITING (GRD)	
Drawing No.: CC130512-1-1	Rev. No.: 2
Drawn By: PETER ARCHIBALD	Sheet No: 1 of 1
Date: 15-MAY-2012	Scale: AS DRAWN

Appendix IV. ATLANTIC CANADA CONSERVATION DATA CENTER DOCUMENTED SPECIES OBSERVATIONS

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

DATA REPORT 4989: Mulgrave, NS

Prepared 17 April, 2013
by S.L. Robinson, Data Manager

CONTENTS OF REPORT

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of circa 85 NatureServe data centres and heritage programs in 50 states, 10 provinces and 1 territory, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies, plus 4 provincial governments, outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC reports known observations of rare and endangered flora and fauna, in and near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and also known sites of ecological interest. Data summarised in each report is attached as DBF files which may be opened from within data software (Excel, Access) or mapped in GIS (ArcView, MapInfo, AutoCAD).

1.1 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

a.) Data is restricted to use by trained personnel who are sensitive to landowner interests and the potential threat of the information contained here to rare and/or endangered flora and fauna.
b.) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c.) The ACCDC requires Data Users to cease using and delete data 12 months after receipt.
d.) ACCDC data responses are restricted to that data in our Data System at the time of the data request.
e.) Data is qualified in regard to locational uncertainy and period of observation; cf Data Dictionary for details.
f.) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g.) The non-occurrence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.2 ADDITIONAL INFORMATION

Please direct biological questions about ACCDC data to: Sarah Robinson, ACCDC: (506) 364-2664, and technical data queries to: Samara Eaton, CWS (NB and PE): (506) 364-5060 or Julie McKnight, CWS (NS): (902) 426-4196.

For provincial information on rare taxa and protected areas, or information on game animals, deer yards, old growth forest, archeological sites, fish habitat etc, please contact Sherman Boates, NSDNR: (902) 679-6146.

2.0 RARE AND ENDANGERED TAXA

A 100km buffer around the study area contains 4706 records of 380 taxa from 89 sources, a relatively low-to-moderate density of records (quintile 2): 0.15 rec/km2.

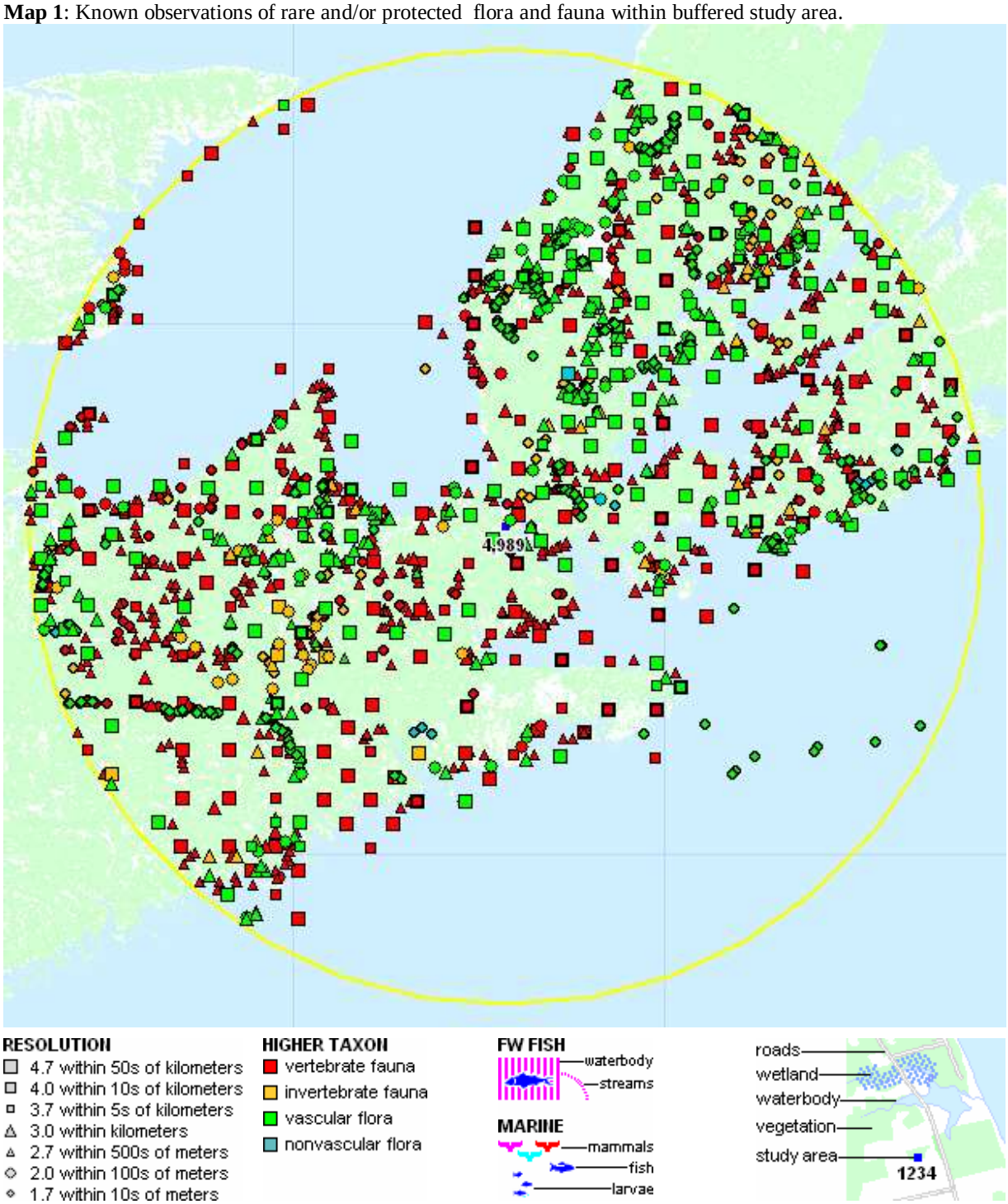
2.1 FLORA

A 100km buffer around the study area contains 1018 records of 224 vascular, 21 records of 12 nonvascular flora (see attached *ob.dbf).

2.2 FAUNA

A 100km buffer around the study area contains 3470 records of 100 vertebrate, 197 records of 44 invertebrate fauna (cf attached *ob.dbf). Sensitive data: Wood Turtles are POTENTIALLY present in the study area (cf attached WOTU.rtf).

Map 1: Known observations of rare and/or protected flora and fauna within buffered study area.



3.0 SPECIAL AREAS

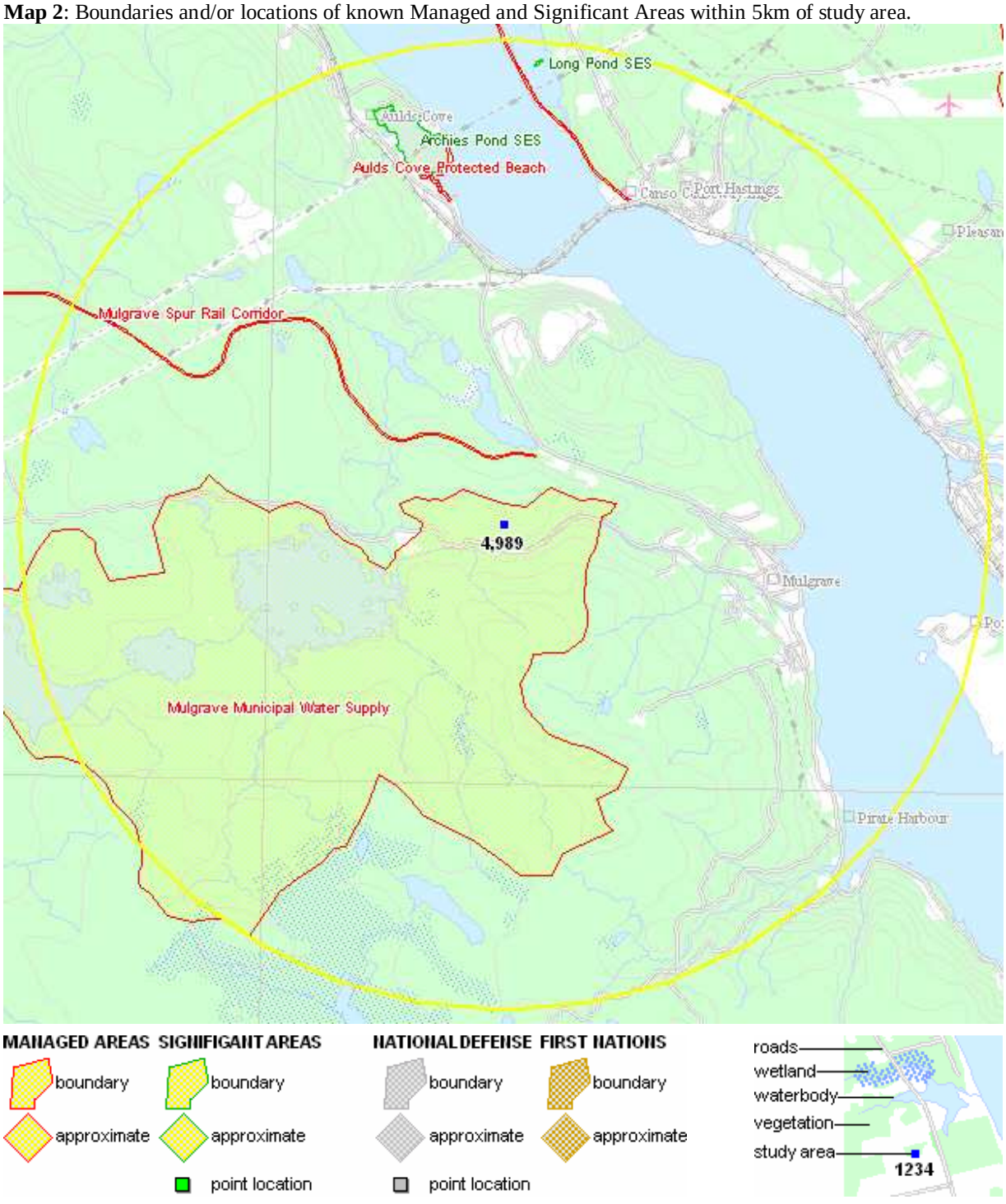
3.1 MANAGED AREAS

The GIS scan identified 4 Managed Areas with some degree of protected status, in the vicinity of the study area (see attached *ma.dbf).

3.2 SIGNIFICANT AREAS

The GIS scan also identified 2 biologically significant sites in the vicinity of the study area; such sites are known for exceptional biotic richness but may or may not have legal status (see attached *sa.dbf).

Map 2: Boundaries and/or locations of known Managed and Significant Areas within 5km of study area.



4.0 TAXON LISTS

Rare and/or endangered taxa within the buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation. [p] = vascular plant, [n] = nonvascular plant, [a] = vertebrate animal, [i] = invertebrate animal, [c] = community.

4.1 FLORA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km
p	Juncus caesariensis	New Jersey Rush	S2	Vulnerable	SC	23	56 ±0
n	Degelia plumbea	Blue Felt Lichen	S2		SC	8	21 ±0.1
p	Floerkea proserpinacoides	False Mermaidweed	S2		NAR	12	13 ±0.1
p	Thuja occidentalis	Eastern White Cedar	S1S2	Vulnerable		1	58 ±10
p	Equisetum palustre	Marsh Horsetail	S1			1	47 ±0
p	Cystopteris laurentiana	Laurentian Bladder Fern	S1			3	48 ±0
p	Cryptogramma stelleri	Steller's Rockbrake	S1			5	44 ±5
p	Potamogeton nodosus	Long-leaved Pondweed	S1			1	80 ±5
p	Trisetum melicoides	Purple False Oats	S1			1	92 ±0
p	Torreyochloa pallida var. pallida	Pale False Manna Grass	S1			1	93 ±10
p	Elymus hystrix var. bigeloviana	Spreading Wild Rye	S1			1	93 ±1
p	Elymus wiegandii	Wiegand's Wild Rye	S1			8	16 ±0
p	Cinna arundinacea	Sweet Wood Reed Grass	S1			3	15 ±0
p	Bromus latiglumis	Broad-Glumed Brome	S1			2	15 ±0
p	Malaxis brachypoda	White Adder's-Mouth	S1			1	4 ±10
p	Triantha glutinosa	Sticky False Asphodel	S1			4	59 ±0
p	Iris prismatica	Slender Blue Flag	S1			3	54 ±10
p	Scirpus pedicellatus	Stalked Bulrush	S1			3	15 ±0
p	Rhynchospora capillacea	Slender Beakrush	S1			5	55 ±1
p	Cyperus lupulinus ssp. macilentus	Hop Flatsedge	S1			4	30 ±1
p	Carex grisea	Inflated Narrow-leaved Sedge	S1			1	38 ±0
p	Carex viridula var. elatior	Greenish Sedge	S1			3	55 ±0
p	Carex tincta	Tinged Sedge	S1			2	25 ±1
p	Carex tenuiflora	Sparse-Flowered Sedge	S1			2	49 ±1
p	Carex livida var. radicaulis	Livid Sedge	S1			5	48 ±5
p	Carex livida	Livid Sedge	S1			2	55 ±0
p	Carex pellita	Woolly Sedge	S1			1	98 ±0
p	Carex haydenii	Hayden's Sedge	S1			1	63 ±5
p	Carex gynocrates	Northern Bog Sedge	S1			1	61 ±0.1
p	Carex granularis	Limestone Meadow Sedge	S1			1	53 ±0
p	Carex alopecoidea	Foxtail Sedge	S1			1	28 ±0.5
p	Viola canadensis	Canada Violet	S1			1	50 ±1
p	Pilea pumila	Dwarf Clearweed	S1			1	83 ±10
p	Scrophularia lanceolata	Lance-leaved Figwort	S1			2	19 ±10
p	Salix candida	Sage Willow	S1			2	59 ±0
p	Montia fontana	Water Blinks	S1			1	6 ±1
p	Polygonum viviparum	Alpine Bistort	S1			1	43 ±1
p	Desmodium canadense	Canada Tick-trefoil	S1			1	98 ±0
p	Cuscuta cephalanthi	Buttonbush Dodder	S1			3	24 ±10
p	Hypericum majus	Large St John's-wort	S1			2	61 ±1
p	Hudsonia tomentosa	Woolly Beach-heath	S1			3	73 ±10
p	Suaeda maritima ssp. richii	White Sea-blite	S1			4	19 ±10
p	Lobelia kalmii	Brook Lobelia	S1			10	36 ±0.1
p	Cochlearia tridactylites	Limestone Scurvy-grass	S1			6	49 ±10
p	Cardamine pratensis var. angustifolia	Cuckoo Flower	S1			3	32 ±10
p	Cardamine pratensis	Cuckoo Flower	S1			5	41 ±0
p	Ageratina altissima	White Snakeroot	S1			2	33 ±10
p	Bidens hyperborea	Estuary Beggarticks	S1			3	39 ±1
p	Arnica lonchophylla	Northern Arnica	S1			1	38 ±10
p	Zizia aurea	Golden Alexanders	S1			5	32 ±1
p	Sanicula odorata	Clustered Sanicle	S1			4	58 ±10
n	Parmeliella parvula	Poor-man's Shingles Lichen	S1?			2	75 ±0
p	Dichanthelium acuminatum var. lindheimeri	Woolly Panic Grass	S1?			1	92 ±0.1
p	Triglochin gaspensis	Gaspé Arrowgrass	S1?			3	16 ±0
p	Schoenoplectus robustus	Sturdy Bulrush	S1?			2	74 ±5
p	Rubus flagellaris	Northern Dewberry	S1?			1	46 ±5
p	Crataegus submollis	Quebec Hawthorn	S1?			2	53 ±10
p	Amelanchier stolonifera	Running Serviceberry	S1?			1	99 ±1
p	Suaeda calceoliformis	Horned Sea-blite	S1?			5	91 ±1
p	Chenopodium rubrum	Red Pigweed	S1?			3	37 ±10
p	Atriplex acadiensis	Maritime Saltbush	S1?			1	73 ±10
p	Solidago hispida	Hairy Goldenrod	S1?			1	93 ±10
n	Nephroma arcticum	Arctic Kidney Lichen	S1S2			1	66 ±10
p	Woodsia alpina	Alpine Cliff Fern	S1S2			1	93 ±0.5
p	Sparganium hyperboreum	Northern Burreed	S1S2			4	50 ±0.1
p	Calamagrostis stricta ssp. stricta	Slim-stemmed Reed Grass	S1S2			1	76 ±1
p	Juncus alpinoarticulatus ssp. nodulosus	Alpine Rush	S1S2			7	31 ±1
p	Juncus stygius ssp. americanus	Moor Rush	S1S2			6	51 ±1
p	Juncus stygius	Moor Rush	S1S2			2	55 ±0
p	Juncus greenei	Greene's Rush	S1S2			2	30 ±1
p	Carex tenera	Tender Sedge	S1S2			3	12 ±1
p	Carex pensylvanica	Pennsylvania Sedge	S1S2			1	64 ±0
p	Carex bebbii	Bebb's Sedge	S1S2			8	33 ±10
p	Ranunculus sceleratus	Cursed Buttercup	S1S2			1	82 ±10
p	Anemone virginiana var. alba	Virginia Anemone	S1S2			4	47 ±0.1
p	Utricularia resupinata	Inverted Bladderwort	S1S2			1	66 ±0.1

p	Cornus suecica	Swedish Bunchberry	S1S2	1	50 ±5
p	Carex vacillans	Estuarine Sedge	S1S3	1	28 ±0.5
p	Equisetum pratense	Meadow Horsetail	S2	4	66 ±0
p	Woodsia glabella	Smooth Cliff Fern	S2	4	49 ±0.1
p	Polystichum lonchitis	Northern Holly Fern	S2	4	28 ±5
p	Dryopteris fragrans var. remotiuscula	Fragrant Wood Fern	S2	1	8 ±10
p	Asplenium trichomanes-ramosum	Green Spleenwort	S2	6	45 ±1
p	Asplenium trichomanes	Maidenhair Spleenwort	S2	1	5 ±0.1
p	Potamogeton friesii	Fries' Pondweed	S2	3	17 ±0
p	Spiranthes lucida	Shining Ladies'-Tresses	S2	9	42 ±0
p	Listera australis	Southern Twayblade	S2	4	15 ±10
p	Cypripedium reginae	Showy Lady's-Slipper	S2	17	8 ±10
p	Cypripedium parviflorum var. makasin	Yellow Lady's-slipper	S2	1	51 ±0.1
p	Cypripedium parviflorum var. pubescens	Yellow Lady's-slipper	S2	4	2 ±0.1
p	Allium schoenoprasum var. sibiricum	Wild Chives	S2	1	38 ±10
p	Juncus trifidus	Highland Rush	S2	2	53 ±5
p	Eriophorum gracile	Slender Cottongrass	S2	1	53 ±1
p	Eleocharis quinqueflora	Few-flowered Spikerush	S2	12	41 ±0
p	Carex scirpoidea	Scirpuslike Sedge	S2	1	100 ±5
p	Carex hystericina	Porcupine Sedge	S2	7	32 ±0
p	Carex comosa	Bearded Sedge	S2	1	73 ±10
p	Carex castanea	Chestnut Sedge	S2	1	100 ±5
p	Carex atratiformis	Scabrous Black Sedge	S2	2	49 ±1
p	Carex atlantica ssp. capillacea	Atlantic Sedge	S2	2	32 ±10
p	Symplocarpus foetidus	Eastern Skunk Cabbage	S2	2	59 ±0
p	Viola nephrophylla	Northern Bog Violet	S2	4	31 ±1
p	Tiarella cordifolia	Heart-leaved Foamflower	S2	1	95 ±10
p	Saxifraga paniculata ssp. neogaea	White Mountain Saxifrage	S2	2	50 ±10
p	Parnassia palustris var. parviflora	Marsh Grass-of-Parnassus	S2	4	52 ±0.5
p	Comandra umbellata	Bastard's Toadflax	S2	1	28 ±10
p	Salix pedicellaris	Bog Willow	S2	3	34 ±0
p	Galium labradoricum	Labrador Bedstraw	S2	2	61 ±0
p	Ranunculus flammula var. flammula	Lesser Spearwort	S2	1	48 ±10
p	Caltha palustris	Yellow Marsh Marigold	S2	10	52 ±10
p	Anemone virginiana	Virginia Anemone	S2	5	39 ±0
p	Anemone quinquefolia	Wood Anemone	S2	3	66 ±0.5
p	Anemone canadensis	Canada Anemone	S2	2	13 ±0.1
p	Pyrola minor	Lesser Pyrola	S2	3	48 ±1
p	Samolus valerandi ssp. parviflorus	Seaside Brookweed	S2	2	38 ±0
p	Rumex salicifolius var. mexicanus	Triangular-valve Dock	S2	4	19 ±5
p	Oenothera fruticosa ssp. glauca	Narrow-leaved Evening Primrose	S2	1	94 ±10
p	Myriophyllum farwellii	Farwell's Water Milfoil	S2	3	8 ±10
p	Vaccinium uliginosum	Alpine Bilberry	S2	2	83 ±10
p	Vaccinium caespitosum	Dwarf Bilberry	S2	10	63 ±0
p	Vaccinium boreale	Northern Blueberry	S2	11	43 ±1
p	Empetrum eamesii	Pink Crowberry	S2	1	99 ±5
p	Shepherdia canadensis	Soapberry	S2	12	47 ±0
p	Crassula aquatica	Water Pygmyweed	S2	3	48 ±10
p	Triosteum aurantiacum	Orange-fruited Tinker's Weed	S2	31	30 ±1
p	Stellaria humifusa	Saltmarsh Starwort	S2	3	81 ±0.1
p	Draba arabisans	Rock Whitlow-Grass	S2	1	48 ±1
p	Betula michauxii	Newfoundland Dwarf Birch	S2	6	57 ±0
p	Betula borealis	Northern Birch	S2	2	60 ±10
p	Caulophyllum thalictroides	Blue Cohosh	S2	10	16 ±0
p	Impatiens pallida	Pale Jewelweed	S2	7	16 ±1
p	Senecio pseudoarnica	Seabeach Ragwort	S2	7	6 ±1
p	Rudbeckia laciniata var. gaspereauensis	Cut-Leaved Coneflower	S2	1	33 ±10
p	Hieracium robinsonii	Robinson's Hawkweed	S2	1	98 ±0.5
p	Erigeron philadelphicus	Philadelphia Fleabane	S2	6	43 ±10
p	Osmorhiza longistylis	Smooth Sweet Cicely	S2	11	31 ±1
n	Scorpidium scorpioides	Hooked Scorpion Moss	S2?	1	53 ±10
n	Platydictya jungermannioides	False Willow Moss	S2?	1	40 ±0
n	Paludella squarrosa	Tufted Fen Moss	S2?	1	74 ±5
p	Dichanthelium linearifolium	Narrow-leaved Panic Grass	S2?	1	93 ±10
p	Juncus dudleyi	Dudley's Rush	S2?	15	42 ±0
p	Amelanchier fernaldii	Fernald's Serviceberry	S2?	2	43 ±1
p	Epilobium coloratum	Purple-veined Willowherb	S2?	2	38 ±0.5
p	Symphyotrichum boreale	Boreal Aster	S2?	4	53 ±0
p	Hieracium kalmii	Kalm's Hawkweed	S2?	1	62 ±0.1
n	Peltigera collina	Tree Pelt Lichen	S2S3	2	21 ±0.1
n	Usnea mutabilis	Bloody Beard Lichen	S2S3	1	35 ±10
n	Leptogium teretiusculum	Beaded Jellyskin Lichen	S2S3	1	97 ±0
p	Potamogeton zosteriformis	Flat-stemmed Pondweed	S2S3	5	58 ±0
p	Potamogeton richardsonii	Richardson's Pondweed	S2S3	5	19 ±5
p	Potamogeton obtusifolius	Blunt-leaved Pondweed	S2S3	12	17 ±0
p	Stuckenia filiformis ssp. alpina	Thread-leaved Pondweed	S2S3	16	16 ±0
p	Poa glauca	Glaucous Blue Grass	S2S3	2	48 ±0
p	Alopecurus aequalis	Short-awned Foxtail	S2S3	9	17 ±0
p	Cypripedium parviflorum	Yellow Lady's-slipper	S2S3	18	36 ±0.1
p	Lilium canadense	Canada Lily	S2S3	24	15 ±0
p	Eleocharis olivacea	Yellow Spikerush	S2S3	2	43 ±5
p	Carex hirtifolia	Pubescent Sedge	S2S3	6	16 ±0
p	Carex adusta	Lesser Brown Sedge	S2S3	1	86 ±5
p	Veronica serpyllifolia ssp. humifusa	Thyme-Leaved Speedwell	S2S3	2	81 ±0
p	Salix pellita	Satiny Willow	S2S3	1	6 ±1
p	Polygonum raii	Sharp-fruited Knotweed	S2S3	5	28 ±1

p	Polygala sanguinea	Blood Milkwort	S2S3	1	96 ±1
p	Fraxinus nigra	Black Ash	S2S3	27	16 ±0
p	Hedeoma pulegioides	American False Pennyroyal	S2S3	2	55 ±5
p	Halenia deflexa	Spurred Gentian	S2S3	4	34 ±0.1
p	Hypericum dissimulatum	Disguised St John's-wort	S2S3	1	29 ±1
p	Betula pumila	Bog Birch	S2S3	2	60 ±0
p	Symphyotrichum ciliolatum	Fringed Blue Aster	S2S3	2	48 ±10
p	Asclepias incarnata ssp. pulchra	Swamp Milkweed	S2S3	5	47 ±1
p	Equisetum variegatum	Variegated Horsetail	S3	7	42 ±0
p	Sparganium natans	Small Burreed	S3	4	44 ±0.5
p	Dichanthelium clandestinum	Deer-tongue Panic Grass	S3	8	64 ±5
p	Platanthera orbiculata	Small Round-leaved Orchid	S3	3	35 ±5
p	Platanthera hookeri	Hooker's Orchid	S3	3	5 ±0.1
p	Platanthera grandiflora	Large Purple Fringed Orchid	S3	12	12 ±1
p	Goodyera repens	Lesser Rattlesnake-plantain	S3	9	18 ±0
p	Goodyera oblongifolia	Menzies' Rattlesnake-plantain	S3	6	79 ±10
p	Corallorhiza trifida	Early Coralroot	S3	5	37 ±5
p	Juncus subcaudatus	Woodland Rush	S3	1	98 ±10
p	Schoenoplectus torreyi	Torrey's Bulrush	S3	2	90 ±0
p	Cyperus dentatus	Toothed Flatsedge	S3	2	70 ±0
p	Carex wiegandii	Wiegand's Sedge	S3	2	80 ±0
p	Carex rosea	Rosy Sedge	S3	1	97 ±0
p	Carex eburnea	Bristle-leaved Sedge	S3	8	38 ±5
p	Verbena hastata	Blue Vervain	S3	6	46 ±0.1
p	Laportea canadensis	Canada Wood Nettle	S3	7	15 ±0
p	Limosella australis	Southern Mudwort	S3	5	53 ±5
p	Geocaulon lividum	Northern Comandra	S3	1	15 ±10
p	Salix petiolaris	Meadow Willow	S3	1	34 ±0
p	Galium kamtschaticum	Northern Wild Licorice	S3	6	51 ±1
p	Rosa palustris	Swamp Rose	S3	1	71 ±0
p	Agrimonia gryposepala	Hooked Agrimony	S3	16	16 ±0
p	Rhamnus alnifolia	Alder-leaved Buckthorn	S3	15	15 ±0
p	Ranunculus gmelinii	Gmelin's Water Buttercup	S3	6	39 ±0
p	Pyrola asarifolia	Pink Pyrola	S3	3	60 ±0
p	Primula laurentiana	Laurentian Primrose	S3	1	99 ±10
p	Polygonum scandens	Climbing False Buckwheat	S3	9	15 ±0
p	Polygonum pensylvanicum	Pennsylvania Smartweed	S3	7	15 ±0
p	Epilobium strictum	Downy Willowherb	S3	7	21 ±0.5
p	Epilobium hornemannii	Hornemann's Willowherb	S3	2	92 ±10
p	Decodon verticillatus	Swamp Loosestrife	S3	2	35 ±5
p	Utricularia radiata	Little Floating Bladderwort	S3	1	80 ±0
p	Teucrium canadense	Canada Germander	S3	5	28 ±0.1
p	Proserpinaca palustris var. crebra	Marsh Mermaidweed	S3	6	15 ±0
p	Proserpinaca palustris	Marsh Mermaidweed	S3	1	15 ±0
p	Bartonia virginica	Yellow Bartonia	S3	1	43 ±0.1
p	Stellaria longifolia	Long-leaved Starwort	S3	1	16 ±0
p	Campanula aparinoides	Marsh Bellflower	S3	7	48 ±5
p	Packera paupercula	Balsam Groundsel	S3	11	39 ±0
p	Megalodonta beckii	Water Beggarticks	S3	7	45 ±0.5
p	Erigeron hyssopifolius	Hyssop-leaved Fleabane	S3	8	50 ±0.1
p	Asclepias incarnata	Swamp Milkweed	S3	15	32 ±0
n	Collema furfuraceum	Blistered Tarpaper Lichen	S3?	1	66 ±10
n	Nephroma bellum	Naked Kidney Lichen	S3?	1	66 ±10
n	Sticta fuliginosa	Peppered Moon Lichen	S3?	1	74 ±0
p	Potamogeton praelongus	White-stemmed Pondweed	S3?	12	34 ±0.1
p	Elodea canadensis	Canada Waterweed	S3?	1	70 ±0
p	Carex cryptolepis	Hidden-scaled Sedge	S3?	1	55 ±0
p	Equisetum scirpoides	Dwarf Scouring-Rush	S3S4	5	51 ±1
p	Equisetum hyemale var. affine	Common Scouring-rush	S3S4	8	41 ±0
p	Equisetum hyemale	Common Scouring-rush	S3S4	1	52 ±0
p	Cystopteris bulbifera	Bulblet Bladder Fern	S3S4	18	5 ±1
p	Trisetum spicatum	Narrow False Oats	S3S4	2	55 ±0
p	Liparis loeselii	Loesel's Twayblade	S3S4	9	30 ±5
p	Luzula parviflora	Small-flowered Woodrush	S3S4	8	73 ±0
p	Juncus acuminatus	Sharp-fruited Rush	S3S4	1	46 ±0
p	Sisyrinchium angustifolium	Narrow-leaved Blue-eyed-grass	S3S4	15	16 ±1
p	Lindernia dubia	Yellow-seeded False Pimperel	S3S4	2	16 ±0
p	Polygonum robustius	Stout Smartweed	S3S4	3	16 ±0
p	Sanguinaria canadensis	Bloodroot	S3S4	22	16 ±0
p	Utricularia gibba	Humped Bladderwort	S3S4	1	41 ±10
p	Myriophyllum sibiricum	Siberian Water Milfoil	S3S4	1	61 ±0.1
p	Angelica atropurpurea	Purple-stemmed Angelica	S3S4	6	14 ±0
p	Eleocharis erythropoda	Red-stemmed Spikerush	SH	1	45 ±0
p	Solidago simplex var. randii	Sticky Goldenrod	SH	2	28 ±5

4.2 FAUNA

	scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km
a	Sterna dougallii	Roseate Tern	S1B	Endangered	E	14	40 ±5
a	Charadrius melodus melodus	Piping Plover melodus ssp	S1B	Endangered	E	68	13 ±0.5
a	Calidris canutus rufa	Red Knot	S2S3M	Endangered	E	8	25 ±0.5
a	Myotis lucifugus	Little Brown Myotis	S1		E	17	26 ±10
a	Morone saxatilis	Striped Bass	S1		E,E,SC	4	38 ±10
a	Chaetura pelagica	Chimney Swift	S2S3B	Endangered	T	35	29 ±0.1
a	Chordeiles minor	Common Nighthawk	S3B	Threatened	T	48	3 ±5
a	Catharus bicknelli	Bicknell's Thrush	S1S2B	Vulnerable	T	7	43 ±5
a	Glyptemys insculpta	Wood Turtle	S3	Vulnerable	T	45	3 ±10

a	Acipenser oxyrinchus	Atlantic Sturgeon	S1?		T	1	89 ±10
a	Caprimulgus vociferus	Whip-Poor-Will	S1?B		T	2	39 ±5
a	Hylocichla mustelina	Wood Thrush	S1B		T	5	25 ±5
a	Wilsonia canadensis	Canada Warbler	S3B		T	84	3 ±5
a	Hirundo rustica	Barn Swallow	S3B		T	148	8 ±5
a	Contopus cooperi	Olive-sided Flycatcher	S3B		T	146	3 ±5
a	Dolichonyx oryzivorus	Bobolink	S3S4B		T	86	8 ±5
a	Histrionicus histrionicus pop. 1	Harlequin Duck - Eastern pop.	S2N	Endangered	SC	11	29 ±10
i	Lampsilis cariosa	Yellow Lampmussel	S1	Threatened	SC	1	100 ±0.1
a	Passerculus sandwichensis princeps	Savannah Sparrow princeps ssp	S1B		SC	1	64 ±5
a	Bucephala islandica (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	S1N		SC	2	94 ±0.1
a	Asio flammeus	Short-eared Owl	S1S2		SC	1	78 ±5
i	Alasmidonta varicosa	Brook Floater	S1S2		SC	6	28 ±0.1
i	Danaus plexippus	Monarch	S2B		SC	4	50 ±1
a	Euphagus carolinus	Rusty Blackbird	S2S3B		SC	57	8 ±5
a	Contopus virens	Eastern Wood-Pewee	S3S4B		SC	81	3 ±5
a	Chelydra serpentina	Snapping Turtle	S5		SC	8	38 ±0.1
a	Puma concolor pop. 1	Cougar - Eastern pop.	SH		DD	34	12 ±1
a	Lynx canadensis	Canadian Lynx	S1	Endangered	NAR	17	23 ±1
a	Sorex dispar	Long-tailed Shrew	S1		NAR	5	53 ±10
a	Aegolius funereus	Boreal Owl	S1B		NAR	1	29 ±0.1
a	Hemidactylium scutatum	Four-toed Salamander	S3		NAR	16	3 ±10
a	Sialia sialis	Eastern Bluebird	S3B		NAR	6	11 ±5
a	Sterna hirundo	Common Tern	S3B		NAR	124	3 ±5
a	Gavia immer	Common Loon	S3B,S4N		NAR	207	3 ±5
a	Accipiter gentilis	Northern Goshawk	S3S4		NAR	30	29 ±5
a	Alces americanus	Moose	S1	Endangered		18	44 ±10
a	Martes americana	American Marten	S1	Endangered		10	57 ±10
i	Leptodea ochracea	Tidewater Mucket	S1			1	98 ±10
i	Coenagrion interrogatum	Subarctic Bluet	S1			1	95 ±0.1
i	Somatochlora williamsoni	Williamson's Emerald	S1			2	80 ±0.1
i	Ophiogomphus mainensis	Maine Snaketail	S1			1	56 ±0.1
i	Ophiogomphus aspersus	Brook Snaketail	S1			3	20 ±0.1
i	Polygonia gracilis	Hoary Comma	S1			2	76 ±1
i	Lycaena dorcas	Dorcas Copper	S1			4	56 ±0.5
a	Vireo gilvus	Warbling Vireo	S1?B			5	18 ±5
a	Toxostoma rufum	Brown Thrasher	S1?B			1	98 ±5
a	Tringa solitaria	Solitary Sandpiper	S1?B,S4S5M			2	37 ±0.1
a	Progne subis	Purple Martin	S1B			1	79 ±0.5
a	Nycticorax nycticorax	Black-crowned Night-heron	S1B			1	39 ±5
a	Alca torda	Razorbill	S1B,S4N			2	83 ±5
a	Calidris minutilla	Least Sandpiper	S1B,S5M			20	16 ±0.5
a	Larus delawarensis	Ring-billed Gull	S1B,S5N			6	58 ±0.1
a	Picoides dorsalis	American Three-toed Woodpecker	S1S2			4	39 ±5
i	Nymphalis vaualbum j-album	Compton Tortoiseshell	S1S2			1	50 ±1
i	Papilio brevicauda	Short-tailed Swallowtail	S1S2			3	74 ±10
a	Passerina cyanea	Indigo Bunting	S1S2B			1	29 ±5
a	Charadrius semipalmatus	Semipalmated Plover	S1S2B,S5M			27	16 ±0.5
a	Martes pennanti	Fisher	S2			1	79 ±10
a	Microtus chrotorrhinus	Rock Vole	S2			3	53 ±10
a	Salmo salar	Atlantic Salmon	S2			63	13 ±10
a	Asio otus	Long-eared Owl	S2			5	19 ±5
i	Lampsilis radiata	Eastern Lampmussel	S2			18	13 ±0.1
i	Somatochlora septentrionalis	Muskeg Emerald	S2			3	76 ±0.1
i	Somatochlora forcipata	Forcipate Emerald	S2			3	68 ±1
i	Gomphus descriptus	Harpoon Clubtail	S2			7	20 ±0.1
i	Aglais milberti	Milbert's Tortoiseshell	S2			1	76 ±1
i	Boloria chariclea	Arctic Fritillary	S2			1	82 ±0.1
i	Satyrium calanus	Banded Hairstreak	S2			1	70 ±0.1
i	Lycaena dospassosi	Maritime Copper	S2			1	49 ±0.1
i	Pieris oleracea	Mustard White	S2			19	31 ±0.1
i	Thorybes pylades	Northern Cloudywing	S2			4	32 ±0
a	Vireo philadelphicus	Philadelphia Vireo	S2?B			2	48 ±5
a	Piranga olivacea	Scarlet Tanager	S2B			4	46 ±5
a	Empidonax traillii	Willow Flycatcher	S2B			1	83 ±5
a	Cepphus grylle	Black Guillemot	S2B			20	28 ±5
a	Rallus limicola	Virginia Rail	S2B			3	19 ±5
a	Anas acuta	Northern Pintail	S2B			3	28 ±10
a	Phalacrocorax carbo	Great Cormorant	S2B			29	38 ±0.5
i	Pantala hymenaea	Spot-Winged Glider	S2B			2	70 ±1
a	Rissa tridactyla	Black-legged Kittiwake	S2B,S4S5N			1	94 ±0.5
a	Bucephala clangula	Common Goldeneye	S2B,S5N			33	8 ±5
i	Alasmidonta undulata	Triangle Floater	S2S3			3	34 ±0.1
i	Erynnis juvenalis	Juvenal's Duskywing	S2S3			1	42 ±1
a	Icterus galbula	Baltimore Oriole	S2S3B			12	3 ±5
a	Molothrus ater	Brown-headed Cowbird	S2S3B			25	13 ±5
a	Pooecetes gramineus	Vesper Sparrow	S2S3B			5	18 ±5
a	Tringa semipalmata	Willet	S2S3B			80	3 ±5
a	Poecile hudsonica	Boreal Chickadee	S3			162	3 ±5
i	Amphiagrion saucium	Eastern Red Damsel	S3			4	37 ±0.1
i	Sympetrum danae	Black Meadowhawk	S3			8	15 ±0.1
i	Nannothemis bella	Elfin Skimmer	S3			2	8 ±0.1
i	Somatochlora tenebrosa	Clamp-Tipped Emerald	S3			2	90 ±0.1
i	Gomphaeschna furcillata	Harlequin Darner	S3			2	8 ±0.1
i	Boyeria grafiana	Ocellated Darner	S3			2	89 ±1
i	Aeshna clepsydra	Mottled Darner	S3			2	7 ±0.1

i	Ophiogomphus carolus	Riffle Snaketail	S3	23	13 ±0.1
i	Lanthus parvulus	Northern Pygmy Clubtail	S3	11	32 ±1
i	Oeneis jutta	Jutta Arctic	S3	2	37 ±0
i	Polygonia faunus	Green Comma	S3	9	32 ±0.1
i	Euphydryas phaeton	Baltimore Checkerspot	S3	6	30 ±1
i	Hesperia comma laurentina	Laurentian Skipper	S3	3	50 ±1
i	Hesperia comma	Common Branded Skipper	S3	12	50 ±1
a	Dendroica tigrina	Cape May Warbler	S3?B	22	8 ±5
a	Coccyzus erythropthalmus	Black-billed Cuckoo	S3?B	21	25 ±5
a	Pinicola enucleator	Pine Grosbeak	S3?B,S5N	51	11 ±5
a	Mimus polyglottos	Northern Mockingbird	S3B	11	3 ±5
a	Dumetella carolinensis	Gray Catbird	S3B	50	3 ±5
a	Petrochelidon pyrrhonota	Cliff Swallow	S3B	58	8 ±5
a	Riparia riparia	Bank Swallow	S3B	82	11 ±5
a	Sterna paradisaea	Arctic Tern	S3B	34	14 ±5
a	Anas discors	Blue-winged Teal	S3B	45	15 ±5
a	Podilymbus podiceps	Pied-billed Grebe	S3B	22	18 ±5
i	Polygonia interrogationis	Question Mark	S3B	2	50 ±1
a	Tringa melanoleuca	Greater Yellowlegs	S3B,S5M	40	16 ±0.5
a	Mergus serrator	Red-breasted Merganser	S3B,S5N	47	8 ±5
a	Calidris pusilla	Semipalmated Sandpiper	S3M	21	16 ±0.5
a	Limosa haemastica	Hudsonian Godwit	S3M	4	38 ±0.5
a	Numenius phaeopus hudsonicus	Hudsonian Whimbrel	S3M	3	37 ±10
a	Pluvialis dominica	American Golden-Plover	S3M	8	38 ±0.5
a	Branta bernicla	Brant	S3M	1	29 ±10
a	Calidris maritima	Purple Sandpiper	S3N	11	8 ±10
a	Synaptomys cooperi	Southern Bog Lemming	S3S4	2	53 ±10
a	Cardinalis cardinalis	Northern Cardinal	S3S4	4	53 ±5
a	Perisoreus canadensis	Gray Jay	S3S4	107	3 ±5
a	Picoides arcticus	Black-backed Woodpecker	S3S4	27	14 ±0.5
i	Polygonia progne	Grey Comma	S3S4	10	38 ±0
i	Speyeria aphrodite	Aphrodite Fritillary	S3S4	1	37 ±1
i	Callophrys polios	Hoary Elfin	S3S4	2	29 ±1
i	Satyrium liparops	Striped Hairstreak	S3S4	1	69 ±0.1
a	Passerella iliaca	Fox Sparrow	S3S4B	36	11 ±5
a	Pheucticus ludovicianus	Rose-breasted Grosbeak	S3S4B	64	8 ±5
a	Wilsonia pusilla	Wilson's Warbler	S3S4B	29	3 ±5
a	Dendroica striata	Blackpoll Warbler	S3S4B	36	3 ±5
a	Dendroica castanea	Bay-breasted Warbler	S3S4B	82	3 ±5
a	Vermivora peregrina	Tennessee Warbler	S3S4B	57	3 ±5
a	Tyrannus tyrannus	Eastern Kingbird	S3S4B	39	3 ±5
a	Sayornis phoebe	Eastern Phoebe	S3S4B	14	3 ±5
a	Empidonax flaviventris	Yellow-bellied Flycatcher	S3S4B	168	3 ±5
a	Gallinago delicata	Wilson's Snipe	S3S4B	41	28 ±5
a	Actitis macularius	Spotted Sandpiper	S3S4B	167	3 ±5
a	Charadrius vociferus	Killdeer	S3S4B	55	3 ±5
a	Botaurus lentiginosus	American Bittern	S3S4B	38	3 ±5
a	Carduelis pinus	Pine Siskin	S3S4B,S5N	98	3 ±5
a	Morus bassanus	Northern Gannet	SHB,S5M	6	15 ±0.5

4.3 RANGE MAPS

The legally protected taxa listed below are linked to the study area by predictive range maps based upon expert estimates of distribution. Taxa listed here but not in the observation data above, are unknown within the study area but perhaps present. Ranges of rank 1 indicate possible occurrence, those of rank 2 and 3 increasingly less probable.

	scientific name	common name	prov. rarity	prov. status	COSEWIC	range
a	Glyptemys insculpta	Wood Turtle	S3	Vulnerable	T	1
p	Listera australis	Southern Twayblade	S2			1
p	Isoetes prototypus	Prototype Quillwort	S2	Vulnerable	SC	1
n	Erioderma pedicellatum	Boreal Felt Lichen (Atlantic pop.)	S1S2	Endangered	E	2
p	Eriocaulon parkeri	Parker's Pipewort			NAR	2

5.0 SOURCE BIBLIOGRAPHY

The recipient of this data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

recs	source
1799	Lepage, D. 2009. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 143,498 recs.
816	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
203	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
193	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
152	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
152	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
126	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
120	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
114	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
83	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
71	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
66	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
65	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
62	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
54	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
47	Blaney, C.S & Spicer, C.D.; Popma, T.M.; Basquill, S.P. 2003. Vascular Plant Surveys of Northumberland Strait Rivers & Amherst Area Peatlands. Nova Scotia Museum Research Grant, 501 recs.
43	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
42	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
41	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
39	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
33	Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor couguar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
31	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
31	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
28	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
19	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
19	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
16	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
16	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
15	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 293 recs.
13	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
13	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
13	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
12	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 717 recs.
10	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
10	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
9	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
8	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
7	"Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs."
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
5	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
5	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
5	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
5	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
4	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Benjamin, L.K. (compiler). 2002. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 32 spp, 683 recs.
4	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
4	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
4	NSDNR. 2007. Restricted & Limited Use Land Database (RLUL).
3	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
3	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
3	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
3	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
3	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
3	Baechler, Lynn. 2012. Plant observations & photos, 2012. Pers. comm. to S. Blaney, July 2012, 4 recs.
2	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
2	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
2	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
2	Daury, R.W. & Bateman, M.C. 1996. The Barrow's Goldeneye (Bucephala islandica) in the Atlantic Provinces and Maine. Canadian Wildlife Service, Sackville, 47pp.
2	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
2	Bridgland, J. 2006. Cape Breton Highlands National Park Digital Database. Parks Canada, 190 recs.

2 Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.
1 Whittam, R.M. 2000. Senecio pseudoarnica on Country Island. , Pers. comm. to S. Gerriets. 1 rec.
1 Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
1 Robinson, C.B. 1907. Early intervale flora of eastern Nova Scotia. Transactions of the Nova Scotia Institute of Science, 10:502-506. 1 rec.
1 Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
1 Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
1 Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
1 Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
1 Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
1 Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
1 Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1 Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
1 Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1 Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1 Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
1 Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
1 Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
1 Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1 Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
1 Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
1 Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.

Appendix V. ARCHAEOLOGICAL REPORT

NOVA SCOTIA

Communities, Culture & Heritage

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Tel: (902) 424-6475
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August 28, 2013

Ms. April MacIntyre
Davis, MacIntyre and Associates
109 John Stewart Drive
Cole Harbour, NS B2W 4J7

Dear Ms. MacIntyre:

RE: Heritage Research Permit Report
A2013NS030 – Mulgrave Wind Farm ARIA

We have received and reviewed your report on work conducted under the terms of Heritage Research Permit A2013NS030 for an archaeological resource impact assessment of the proposed Mulgrave Wind Farm.

The report details the archaeological resource impact assessment of the proposed Mulgrave Wind Project study area in Mulgrave, Guysborough County by Davis MacIntyre and Associates in March and May 2013. The assessment included a historical and background study and field reconnaissance of the study area in order to determine the potential for archaeological resources within the impact zones. No archaeological resources of significance were observed or noted. No evidence of Pre-contact or historic activity with the exception of logging was found at any of the 3 proposed turbine sites. The reporter noted that the proposed sites appeared to offer little incentive for settlement, timber being the main resource attracting cultural activity. First Nations occupation is unlikely though the surrounding hills and forest may have been used for hunting and gathering. Archaeological evidence of this activity is unlikely to exist.

Based on the above, the reporter states that the turbine sites, access road and surrounding area have been determined to be of low potential for archaeological resources related to both First Nations and Euro-Canadian land use. The reporter also notes that alteration of the landscape and soil caused by construction of a quarry access road, Met tower pad, the installation of a Met tower as well as logging and clearing, impacted the reconnaissance team's ability to identify archaeological resources in the area. There is no evidence that archaeological resources were disturbed, however due to extensive activity it cannot be stated with complete confidence that archaeological resources were not present prior to ground disturbance.

Although located outside the study area, the existing rail bed is a historical feature of the landscape and it is recommended that it should be treated with care in the event of any future developments along its course. Should development plans change so that areas not investigated during this assessment are expected to be impacted, it is recommended that those areas be subjected to an ARIA by a qualified archaeologist.

Finally, the reporter recommends that in the event that any archaeological material is encountered during further ground disturbance activities, it is required that all activity should cease and the Coordinator of Special Places should be contacted.

Staff agrees with the recommendations and finds the report acceptable as submitted. Please do not hesitate to contact me should you have any questions or concerns.

Sincerely,

Sean Weseloh McKeane
Coordinator, Special Places

cc. Meghan Milloy, McCallum Environmental Ltd.

Mulgrave Wind Project
ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT

Heritage Research Permit A2013NS030

May 2013

Mulgrave Wind Project
Archaeological Resource Impact Assessment

Heritage Research Permit A2013NS030

Category C

Davis MacIntyre & Associates
Project Number 13-012.1

Principal Investigator: Stephen A. Davis
Report Compiled by: Travis Crowell, Laura de Boer & April MacIntyre

Submitted to:

McCallum Environmental Ltd.
208 Kingswood Drive.
Hammonds Plains, Nova Scotia
B4B 1L2

-and-

Coordinator, Special Places
Communities, Culture and Heritage
1747 Summer Street
Halifax, NS
B3H 3A6

Cover Image: New growth trees north-east of the MET tower pad.

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Executive Summary

Davis MacIntyre & Associates conducted an archaeological resource impact assessment of the proposed Mulgrave Wind Project in Guysborough County. The assessment included a historical background study and field reconnaissance of the study area on two separate dates in order to determine the potential for archaeological resources within the impact zone. The assessment concluded that the area immediately surrounding the turbine site and access road is of low archaeological potential and therefore no further mitigation in this area is recommended. However continued caution is recommended in regard to activity around the existing historic rail bed.

1.0 Introduction

In March 2013, Davis MacIntyre & Associates (DM&A) was contracted by McCallum Environmental Ltd. on behalf of Celtic Current Community Wind Development to conduct a phase I archaeological resource impact assessment for a proposed wind turbine near Mulgrave in Guysborough County. The purpose of the assessment was to determine the potential for archaeological resources within the study zone and to provide recommendations for further mitigation if deemed necessary. This assessment included consultation of the Maritime Archaeological Resource Inventory in the Culture and Heritage Development Division of the Nova Scotia Museum as well as historic maps, manuscripts and published resources. A preliminary reconnaissance of the development area was also conducted.

This assessment was conducted under Category C Heritage Resource Permit A2013NS030. This report conforms to the standards required by the Culture and Heritage Development Division under the Special Places program.

2.0 Study Area

Celtic Current Community Wind Development proposes to construct a 2.3 MW and two smaller 50 KW turbines as part of a COMFIT (Community Feed-In Tariff) project in Mulgrave, Guysborough County. The project will consist of three turbines erected on concrete pads as well as an access road (Figure 2.0-2). The access road and MET tower pad had already been constructed and were investigated by archaeologists.

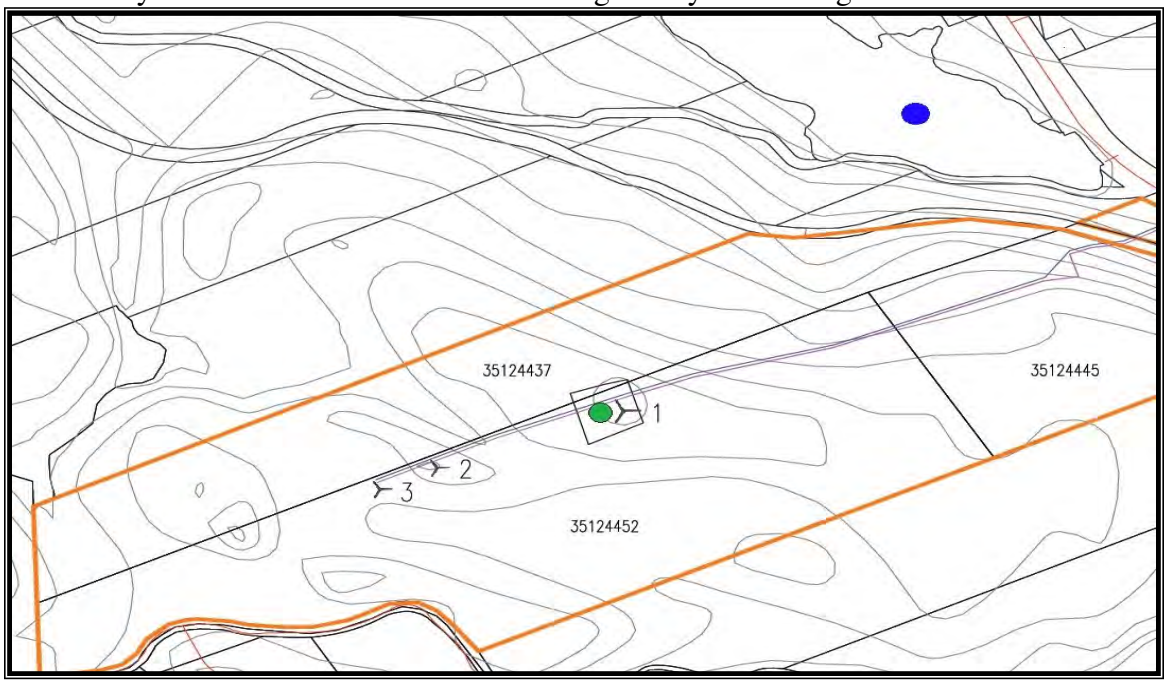

Figure 2.0-1: Project map showing the location of the proposed wind turbine as well as the MET tower marked in green. Morrisons Lake is marked in blue. Map courtesy of McCallum Environmental Ltd.

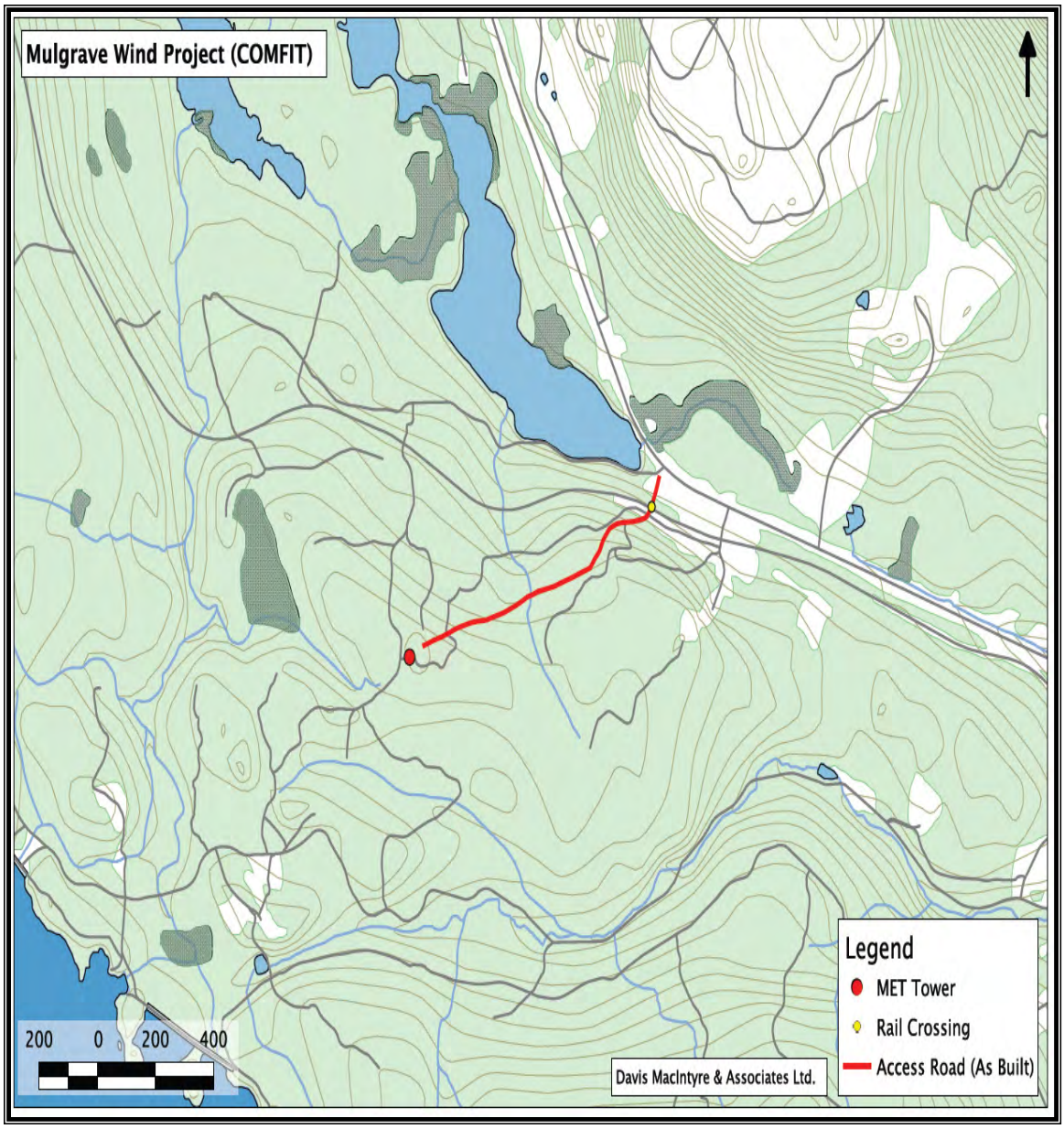

Figure 2.0-2: Map of the study area showing the access road and location of the MET tower. The edge of Grant's Lake is shown in the southwest corner.

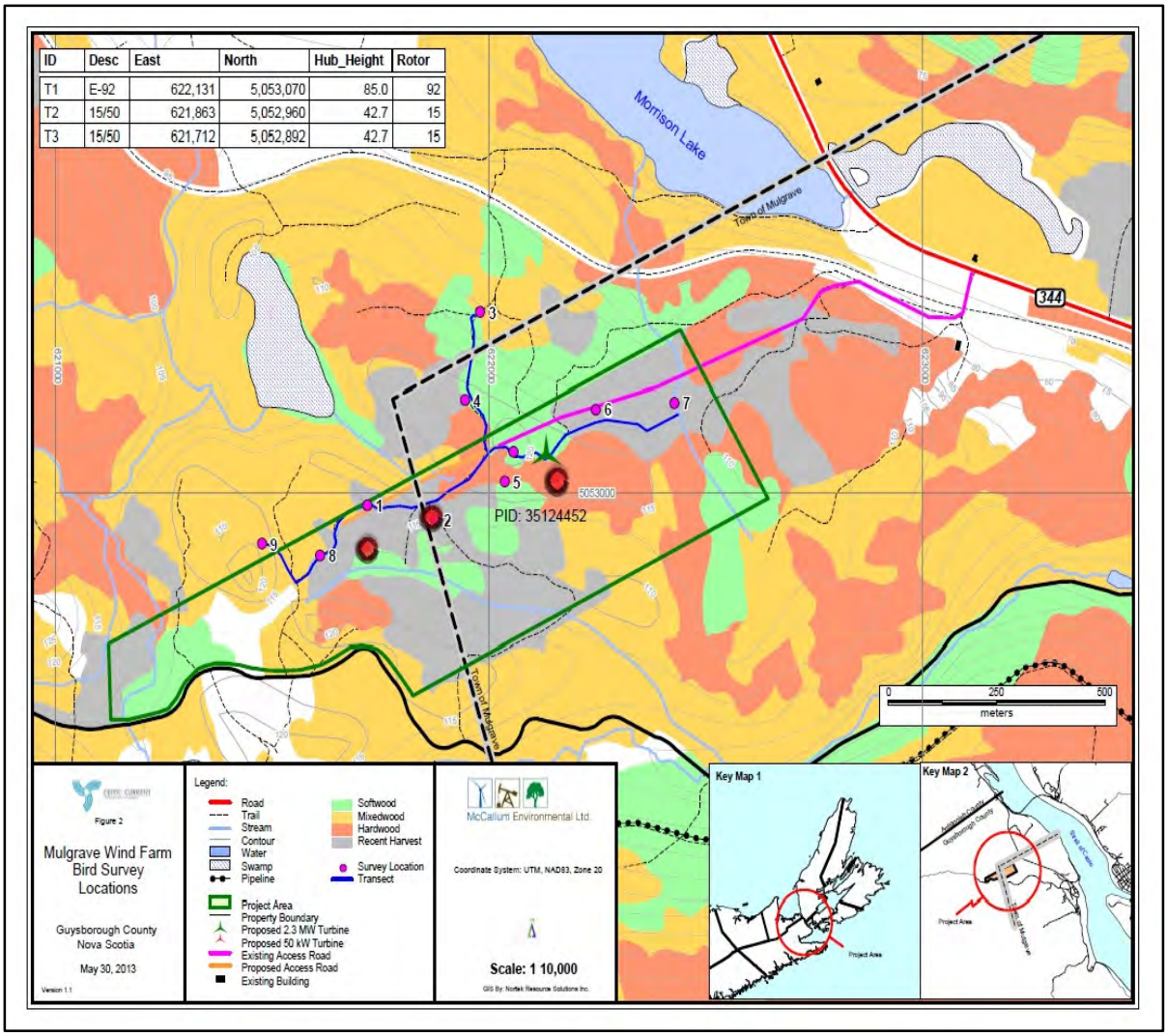

Figure 2.0-3: Map of study area showing approximate location of the three wind turbines in relation to each other marked in red. Map courtesy of Celtic Current.

The Mulgrave wind tower lies within the Mulgrave Plateau region of Nova Scotia which is comprised of stony till at the surface (Figure 2.0-3). North of Chedabucto Bay, the soils are predominantly shallow clay loams, although the soils west of Middle Melford are well drained. This portion of the Plateau is drained by several tertiary watersheds into Chedabucto Bay to the south and the area is interspersed with several small glacial lakes. Mixed wood forests predominate in the immediate vicinity of the development area with Balsam Fir, Black Spruce, Eastern Hemlock, Sugar Maple, and American Beech being common.[2]

[2] Davis and Browne, 1996:132-133.

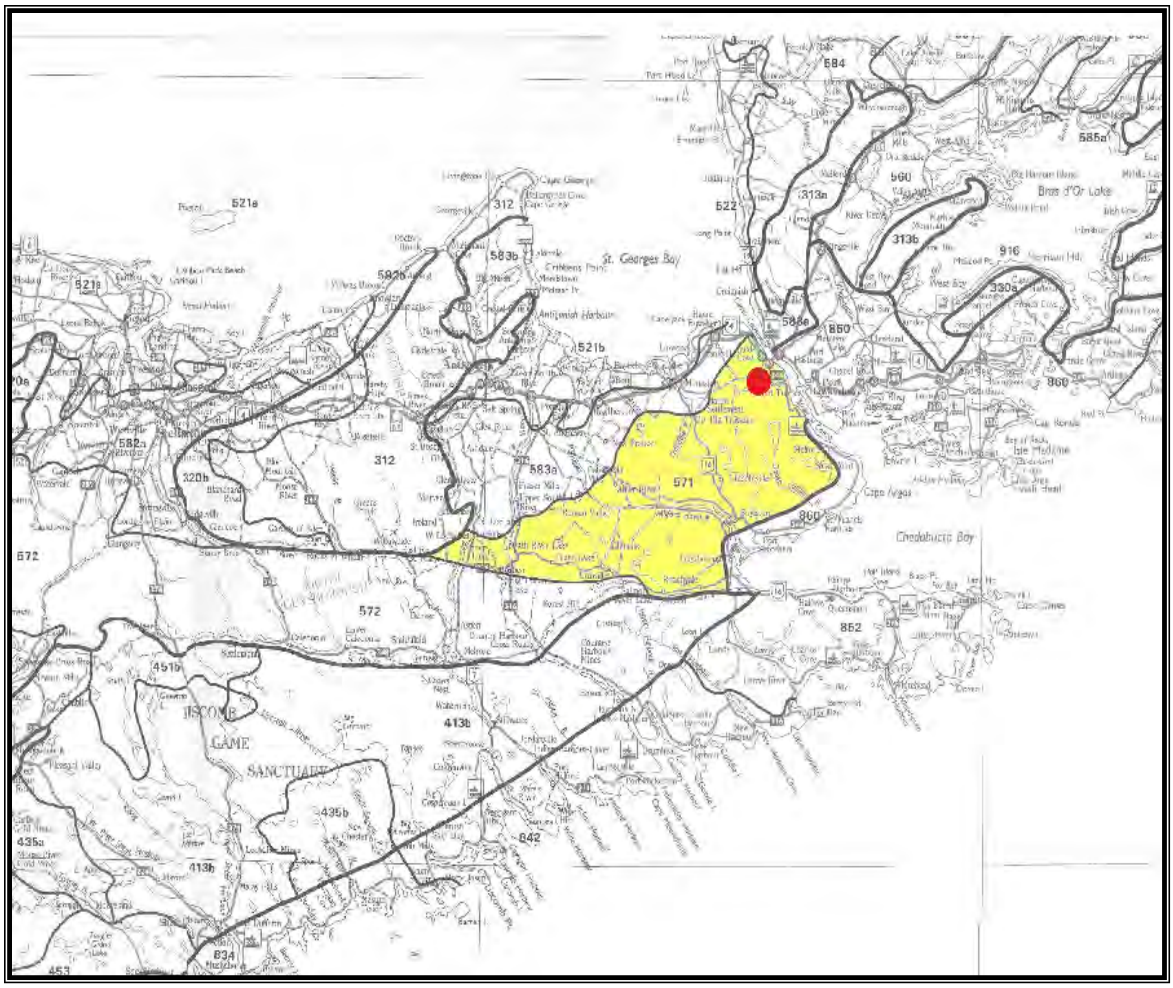

Figure 2.0-4: Map of the Natural Theme Regions of Nova Scotia showing Theme Region # 571 – Mulgrave Plateau.[3]

3.0 Methodology

A historic background study was conducted by DM&A in May 2013. Historical maps, manuscripts, and published literature were consulted at Nova Scotia Archives and Records Management in Halifax. The Maritime Archaeological Resource Inventory, held at the Nova Scotia Museum's Heritage Division, was searched to understand prior archaeological research and known archaeological resources neighbouring the study area.

3.2 Historical Background

3.1 Maritime Archaeological Resource Inventory

The Maritime Archaeological Resource Inventory was accessed on May 9th, 2013 in order to determine if known archaeological sites of resources exist within or near the study area. Seventeen archaeological sites were identified by DM&A around the Mulgrave Wind

[3] Davis and Browne, 1996.

Project area in 2013 (Permit A2013NS030). Most date to the 19th and early 20th centuries. Among the sites are house foundations, field clearing stone piles, stone walls and terraces, and sites with unknown functions and dates. None of these sites fall within study area for the proposed wind turbine and access road**.**

3.2.1 The Precontact Period

The history of human occupation in Nova Scotia has been traced back approximately 11, 000 years ago, to the Palaeo-Indian period or *Saqiwe'k L'nu'k* (11,000 – 9,000 years BP). The only significant evidence of Palaeo-Indian settlement in the province exists at Debert/Belmont in Colchester County.

The *Saqiwe'k Lnu'k* was followed by the *Mu Awsami Kejihaw'k L'nu'k* (Archaic period) (9,000 – 2,500 years BP), which included several traditions of subsistence strategy. The Maritime Archaic people exploited mainly marine resources while the Shield Archaic concentrated on interior resources such as caribou and salmon. The Laurentian Archaic is generally considered to be a more diverse hunting and gathering population.

The Archaic period was succeeded by the Woodland/Ceramic period of *Kejihawek L'nu'k* (2,500 – 500 years BP). Much of the Archaic way of subsistence remained although it was during this period that the first exploitation of marine molluscs is seen in the archaeological record. It was also during this time that ceramic technology was first introduced.

The Woodland period ended with the arrival of Europeans and the beginning of recorded history. The initial phase of contact between First Nations people and Europeans, known as the Protohistoric period, was met with various alliances particularly between the Mi'kmaq and the French.

The Mi'kmaq inhabited the territory known as *Mi'kma'ki* or *Megumaage*, which included all of Nova Scotia including Cape Breton, Prince Edward Island, New Brunswick (north of the Saint John River), the Gaspé region of Quebec, part of the Maine and southwestern Newfoundland.

The first documented settlers around the Strait of Canso and Chedabucto Bay were the Mi'kmaq and, in fact, the name Chedabucto was taken from the Mi'kmaq word *Sedabooktook* meaning "running far back", probably referring to the long bay, and the district from Canso to Halifax was known as *Eskegawaage*.[4] The Gut of Canso was known to the Mi'kmaq as *Tooegunuk* or "outlet" and the area around Mulgrave *Wolumkwagagunutk* or "lobster ground".[5] In about the year 1929 "somewhere in or near Mulgrave", the father of Berny Carter reported having ploughed up a stone "tomahawk" and a George Carter reportedly found a French trade axe. Both finds have been recorded in the Maritime Archaeological Resource Inventory and lend support to a Mi'kmaq presence here.

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[4] Rand, 1875: 85

[5] Rand, 1875: 105

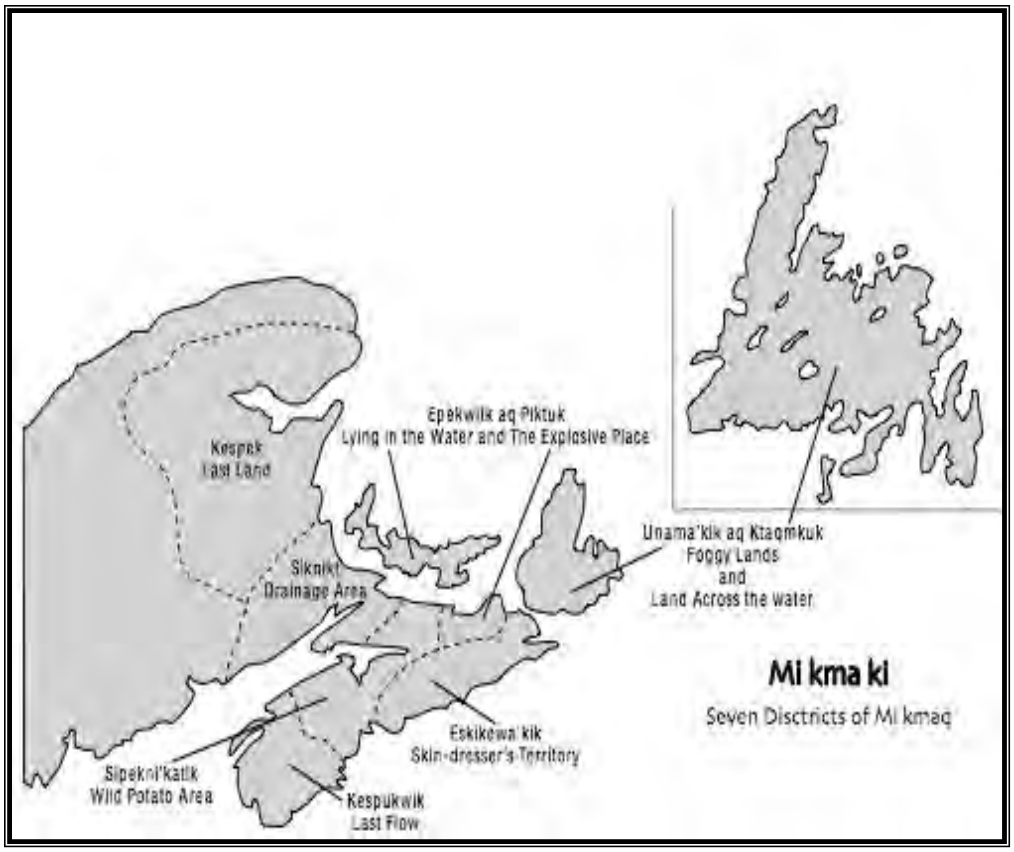

Figure 3.2.1-1: Map of the Mi'kmaq Districts.[6]

3.2.2 European Settlement

Portuguese, Basque and Breton fisherman had all touched the shores of eastern Nova Scotia and Cape Breton by the sixteenth century. By the seventeenth century emerging colonial ambitions had turned the area into a point of contention for European powers seeking the bounty of the area's waters. The French trader Nicholas Denys, who had already established a settlement and trading post at St. Peter's, set up another fishing and trading post at the head of the Chedabucto Bay where around 120 men fished and settled. This post became a target of British hostilities in 1667 and was destroyed. The French would try to secure control of the area in the 1680's with the building of Fort Saint Louis at what is now Fort Point. However the British again attacked and destroyed the fort in 1690. With the signing of the Treaty of Utrecht in 1713 the French ceded claims of territory to Britain so long as they received ownership and the right to fortify the island of Cape Breton.[7] French settlers still occupied the area of Acadia (mainland Nova Scotia, New Brunswick, and Prince Edward Island) until their expulsion in 1755.

New England immigrants filled the vacancy left by the Acadians in the mid-18th century, with Milford Haven becoming the primary settlement. After the end of the Revolutionary War in 1783, members of Loyalist regiments were offered land grants with the earliest

6 Confederacy of Mainland Mi'kmaq. 2007:11
7 Morgan, 2008: 32-33

grants stretching from Pirate Harbour, south to the north shore of Milford Haven and Chedabucto Bay.[8] At least two Loyalists that came as part of group from St. Augustine, Florida in 1784 were recorded to have brought slaves with them.[9]

Land grants were also made to Loyalist refugees north of Pirate Harbour, including at Mulgrave. Captain William Armstrong, an officer of the British Army during the American Revolutionary War, was the original grantee of land in Mulgrave (Figure 3.1-1). Armstrong arrived in 1785 and had 700 acres of land survey for him at the cove by 1789. Subsequently this was named for him. James Cowie, a Scottish soldier of the Revolution, was granted land to the south of Armstrong at about the same time. Dr. Matthew Harris was granted the lot on the north side of Captain Armstrong's grant. It was purchased by Christian Muller, a German immigrant, in 1803. A year later, Colin McNair bought the old Harris grant, for whom McNair's Point and Cove received their names. In 1861, William Henry Wylde moved to Mulgrave and built an estate. For a short time, the Cove bore his name.

One of the earliest ferry services between the mainland and Cape Breton ran from McNair's Cove to Ship Harbour, or from what are now known as Mulgrave and Port Hawkesbury. The old style of ferry service was sufficient for the needs of the area even after the introduction of steam ferries in 1871 and 1881. The ferries facilitated a daily mail service between Halifax and Cape Breton by 1865.[10] At the turn of the century, the demands of improved railcar transportation between the mainland and Cape Breton required a significant upgrade to the ferry service.

Place names in the Strait of Canso are often the badges of history and reflect its storied maritime past. The harbour opposite of McNair's Cove, now Mulgrave, achieved some importance during the American Revolutionary War when armed vessels were stationed there by the government to protect commercial interests in the area from roving privateers. This is how it earned its name, Ship Harbour.[11]

There is no strong evidence of prolonged settlement in the study area from the 18th to 20th century. James and Alexander Legertwood received the earliest land grants in the area when they were each awarded 500 acres on August 10th, 1811. The Legertwood's land stretched from the edge of Grant's Lake to the shores of the Straight of Canso, abutting the northern boundary of land granted to Alexander Cumming (Figure 3.2.2-1). Of Scottish descent, Cumming was granted 240 acres in 1785 as part of the regimental grant, and was given double the acreage typically awarded to privates. Official documentation of the size of these grants differs from the Crown Land Map which shows Alexander Cumming with a parcel of 500 acres while Alexander Legertwood holds a grant of 207 acres. The reason for this discrepancy is not known.

James and Alexander Legertwood do not feature prominently in written history. It is not

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8 Jost, 1950:117-121

9 Hart, 1975: 124

10 Fergusson, "The Canso Crossing", The Chronicle Herald, June 12, 1954, 4.

11 Hart, 1975: 125

known whether they eventually settled and worked the land they were granted. The study area does contain a portion of the old rail bed from the Inter-Colonial Railway to Mulgrave, built in 1882. An 1884 Geological Survey of Canada map shows settlement east of the northern tip of Grant's Lake but outside of the study area. A mill is depicted to the west, close to the railway, again outside of the study area (Fig. 3.2.2-2)

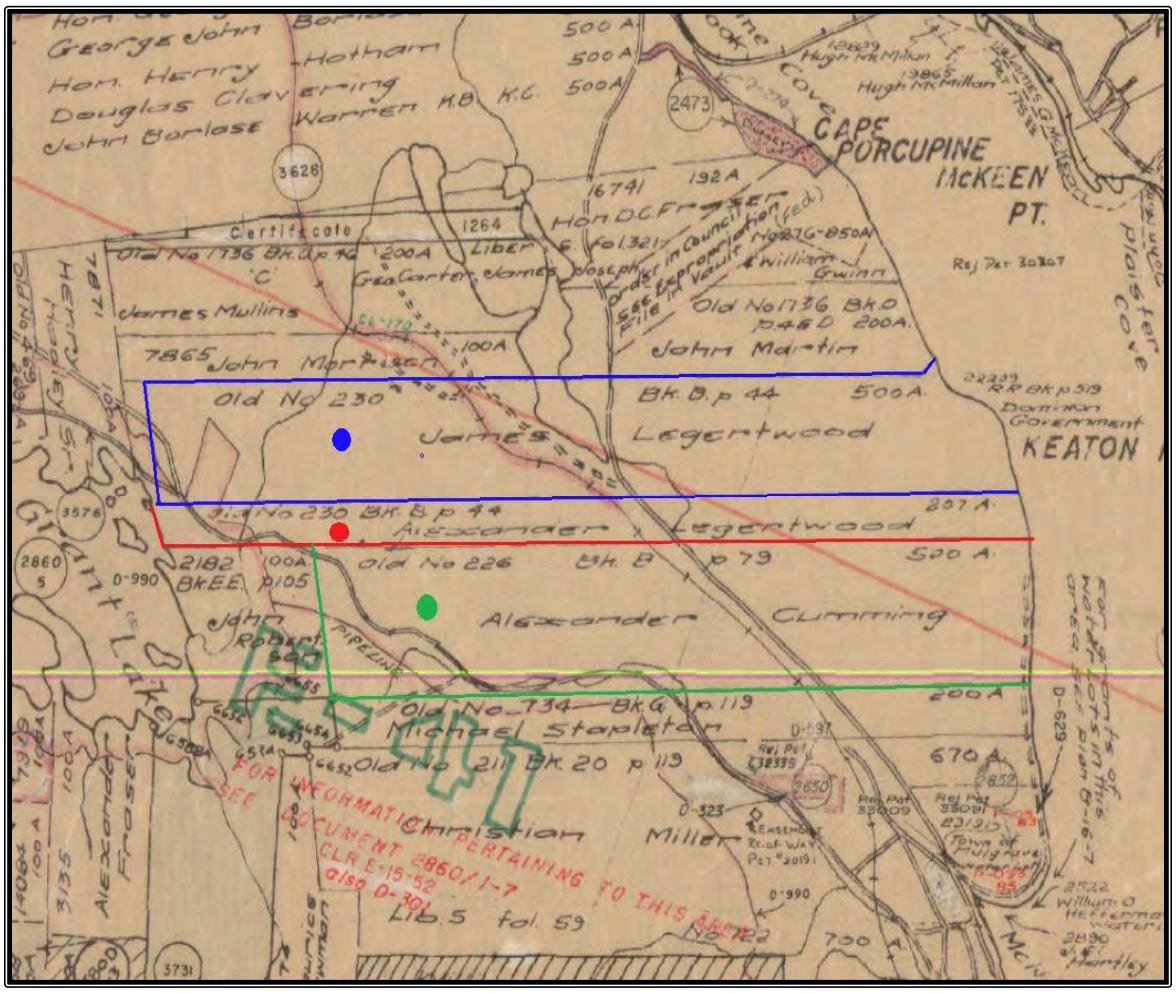

Figure 3.2.2-1: Part of land grants index for Guysborough county.[12] ***The land grants to James & Alexander Legertwood are highlight in blue and red respectively. Alexander Cumming's land grant is in green.***

[12] Nova Scotia Department of Lands & Forests, 2009

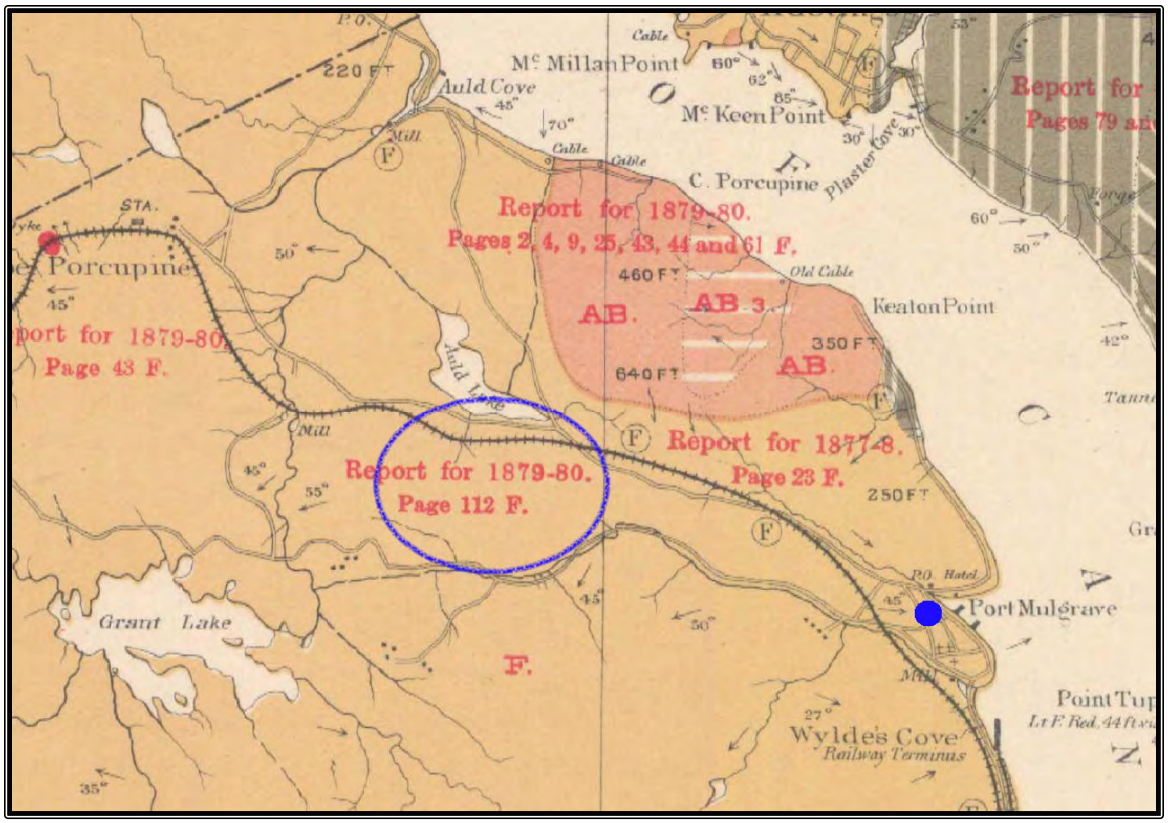

Figure 3.2.2-2: 1884 Geological Survey of Canada map showing the approximate location of the study area in relation to the railway and Mulgrave.[13]

3.3.1 May 7th, 2013 Field Reconnaissance

An archaeological field reconnaissance was conducted on May 7th, 2013 directed by Stephen Davis. The reconnaissance included an access road that had been built of granite gravel prior to reconnaissance, perhaps an improvement on an existing road, as well as a meteorological (MET) tower and its cleared pad at the termination of the road. The access road was south of Highway 344 off an old road, from which it proceeded south-west up an incline towards the MET tower site (Plate 1). Close to the road entrance the new road crosses an abandoned rail bed. The access road was built using fill to bring it level with the rail bed, which was neither completely covered nor disturbed through excavation (Plate 2). Beyond the rail bed, small streams crossed under the road through culverts and tree growth transitioned from softwood to hardwood as the elevation rose.

The recently erected MET tower featured prominently in the landscape as the turbine site was accessed from the south-west (Plate 3). The pad was constructed of quarried gravel over a landscape that had been cleared and levelled in order to erect the MET tower, with about 3 metres of fill found at the edge of the pad to the west (Plate 4). Numerous logging roads could be spotted on the ascent to the turbine site, as well as around the site itself. The nearby area was predominantly hardwood trees like birch, with some new growth of evergreen trees. Cut stumps were present on the uneven forest floor (Plate 5). An exposed

[13] Fletcher, 1884a.

soil profile showed thin topsoil and appeared rocky and bleached indicating a high acidity (Plate 6).

No evidence of past cultural use, with the exception of logging, was found at the site, which had already been disturbed prior to reconnaissance. The primary resource of this area, timber, continues to attract forestry activity to the present, but the area offered little incentive to historic settlement. A lack of navigable or bountiful waterways makes First Nations occupation unlikely, especially with several more appealing areas close-by. However it is acknowledged the hill and surrounding forests may have been used for hunting and gathering. Archaeological evidence of this activity is unlikely to exist.

3.3.2 May 31st, 2013 Field Reconnaissance

An archaeological field reconnaissance was conducted on May 31st directed by Stephen Davis. This work was facilitated by handheld GPS, project maps of the area and detailed field notes and photographs were taken. The purpose of the reconnaissance was to survey the new candidate site for Turbine 1 and also survey the candidate sites for Turbine 2 and Turbine 3. No additional changes had been made to the access road, the MET tower pad, or the surrounding area since the original assessment on May 7th, 2013 by DM&A.

The proposed site for Turbine 1 was located about 40m east of the edge of the MET tower pad. It was accessed by an old bulldozed logging road. Moss-covered stumps in the area and the young growth of mixed hardwood attests to forestry being conducted sometime in the recent past (Plate 7). Multiple smaller trails break off from the old road, providing further evidence that this area has been disturbed by logging activity.

The second turbine site was southwest of the MET tower pad and was again accessed off of an old logging road (Plate 8). The surrounding area was of mixed hardwood, and the understory had some berry bushes beginning to grow (Plate 9). Modern dumping of plastic and rusting metal was noted in the area. Evidence of clear cutting was present.

The site for Turbine 3 is located further southwest from the site for Turbine 2. It was accessed by hiking in south from the old logging road, down a slope inclined at about 40 degrees. Glacial erratics dotted the hillside and level area of the turbine site. The area showed clear evidence of past disturbance from logging. Push-out from bulldozing was present in the area, as well as cut-stumps and new growth. An area of stagnant water was pooled to the south but this appears to be from a lack of drainage. The forest was new growth of mixed wood (Plate 10).

No evidence of Pre-Contact or historic activity with the exception of logging was found in at any of the three sites. The proposed sites for the turbines would appear to offer little incentive to settlement, timber being the main resource attracting cultural activity. As noted in the earlier field reconnaissance, First Nations occupation is unlikely though the surrounding hills and forests may have been used for hunting and gathering. Archaeological evidence of this activity is unlikely to exist.

4.0 Results & Discussions

The historical background study indicates Mulgrave and the area around the Strait of Canso were settled by the Mi'kmaq and First Nations prior to European contact. The study area may have been visited for hunting and gathering, but appears to offer little for long-term settlement and subsistence such as navigable waterways and fishing sites. The landscape outside the study area offers more potential to settlement and activity than the location of the proposed wind turbines on a rugged hill.

European fisherman began to frequent the area by at least the sixteenth century and French settlement attempts began in the seventeenth century led by individuals like Nicholas Denys. The area was valued more for its fisheries potential, while farming and settlement were focused in the river valleys. Loyalist settlement in the later eighteenth century and Scottish immigration through the nineteenth century made up the bulk of the arriving European population. Settlement was always fairly sparse and was focused in the area now known as Mulgrave, where fishing and the ferry service were the primary industries.

Field reconnaissance found an access road climbing south-west to the levelled and quarry rock filled MET tower pad at the top of the hill. The base of the recently constructed road was mixed woodlands which transitioned to primarily hardwood at higher elevation. The area showed evidence of clear-cutting. The land around the turbine sites was hard, rocky, and quite rugged.

5.0 Recommendations & Conclusions

The turbine sites, access road, and surrounding area have been determined to be of low potential for archaeological resources for both First Nations and Euro-Canadians due to the unlikelihood of historical settlement. While the study area is noted as being of low potential for cultural activity, a thorough reconnaissance of the study area was limited due to prior disturbance. Alteration of the landscape and soil caused by construction of an access road, MET tower pad, the installation of a MET tower, as well as logging and clearing, negatively impacted the reconnaissance team's ability to identify archaeological resources in the area. There is no evidence that archaeological resources were disturbed, however due to extensive activity it cannot be stated with complete confidence that archaeological resources were not present prior to ground disturbance.

The existing rail bed is a historical feature of the landscape that should be treated with continued care, as it was with the construction of the access road.

In the unlikely event that archaeological resources are encountered in the area of the turbine site, it is required that all activity cease and the Coordinator of Special Places, (902-424-6475), be contacted immediately regarding a suitable method of mitigation.

6.0 References Cited

Confederacy of Mainland Mi'kmaq. 2007. *Kekina'muek: Learning about the Mi'kmaq of Nova Scotia*. Eastern Woodland Publishing, Truro.

Davis, Derek and Sue Browne. 1996. *The Natural History of Nova Scotia, Volume II: Theme Regions*. The Nova Scotia Museum and Nimbus Publishing, Halifax.

Department of Lands and Forests. 2009 (updated). Crown Lands Index Sheet no. 110.

Fergusson,C. Bruce. 1967. Place Names and Places of Nova Scotia. Public Archives of Nova Scotia, Halifax.

Fergusson,C. Bruce. "The Canso Causeway." *The Chronicle Herald,* June 12, 1954.

Fletcher, Hugh. 1884. Province of Nova Scotia, Island of Cape Breton, Strait of Canso, Sheet No 22. Geological Survey of Canada.

Gilroy, Marion. 1937. *Loyalists and Land Settlement in Nova Scotia*. Public Archives of Nova Scotia, Halifax.

Hart, Harriet C. 1975. *History of the County of Guysborough*. Mika Publishing Company, Belleville.

Jost, A. C. 1950. *Guysborough Sketches and Essays*. The Kentville Publishing Company Limited, Kentville.

Morgan, Robert J. 2008. *Rise Again! The Story of Cape Breton Island: Book One*. Breton Books, Wreck Cove.

Rand, Silas Tertius. 1875. A first reading book in the Micmac language comprising the Micmac numerals, and the names of the different kinds of beasts, birds, fishes, and trees &c. of the Martime provinces of Canada. Halifax: s.n.

Plates

Plate 1: Access road leading southwest up to the MET tower base and pad.

Plate 2: Looking west down the old rail bed which intersects with the access road. Mixed wood is visible at the base.

Plate 3: MET tower base and pad looking southwest.

Plate 4: The southern edge of the pad which is ringed by about 3 metres of cleared fill.

Plate 5: Cut stumps in forest close to the pad.

Plate 6: Soil profile exposed at north edge of the pad.

Plate 7: Looking west down the logging road at the proposed site of Turbine 1.

Plate 8: Candidate site for Turbine 2 looking northwest.

Plate 9: Looking west down the old logging road used to access Turbines 2 and 3.

Plate 10: Proposed site of Turbine 3 looking south.

Appendix A: Heritage Research Permit

NOVA SCOTIA

Heritage Research Permit (Archaeology)

Special Places Protection Act 1989

(Original becomes Permit when approved by Communities, Culture and Heritage)

Office Use Only
Permit Number:
A2013NS030

Greyed out fields will be made publically available. Please choose your project name accordingly

Surname Davis | First Name Stephen

Project Name Mulgrave Wind Project

Name of Organization Davis MacIntyre & Consultants Limited

Representing (if applicable)

Permit Start Date 1 May 2013 | Permit End Date 31 July 2013

General Location: Mulgrave, Guysborough County

Specific Location: *(cite Borden numbers and UTM designations where appropriate and as described separately in accordance with the attached Project Description. Please refer to the appropriate Archaeological Heritage Research Permit Guidelines for the appropriate Project Description format)*

20 T 622017.97 m E 5053087.02 m N (WGS84)

Permit Category:
Please choose one

- ☐ Category A – Archaeological Reconnaissance
- ☐ Category B – Archaeological Research
- ☑ Category C – Archaeological Resource Impact Assessment
- ☑ I certify that I am familiar with the provisions of the *Special Places Protection Act* of Nova Scotia and that I have read, understand and will abide by the terms and conditions listed in the Heritage Research Permit Guidelines for the above noted category.

Signature of applicant for Stephen Davis | Date 30 April 2013

Approved by Executive Director | Date May 1/13

Appendix VI. SOUND IMPACT ASSESSMENT

McCallum Environmental Ltd.
9 North Street
Bedford, Nova Scotia
B4A 2N1

November 29, 2013

Att: Meghan Milloy
Re: Mulgrave Community Wind Project
Sound Modeling

The attached report provides the results of the sound model which we ran for the proposed wind turbine. The sound analysis was completed using WindPro 2.9.207 which provides a comprehensive suite of wind farm design and modeling software. The sound model is based on the ISO 9613-2 – Attenuation of sound during propagation outdoors, Part 2. This international standard provides a conservative estimate of sound propagation and subsequent environmental attenuation as a result of ground porosity, atmospheric attenuation and geometric spreading.

Ground attenuation is considered and uses the alternative case described in the ISO-9613-2 standard. This method uses the surface shape of the terrain to determine the sound dampening characteristic between the turbine hub and the receiver. The terrain is considered to be a bare earth model with no forest, vegetation or buildings. The terrain model was developed from 5 m contour data obtained from the Nova Scotia Geomatics Center.

The A-weighted sound pressure levels are modeled and represent the range of frequencies that are audible to the human ear. Noise emission data were obtained from the turbine manufacturer specifications and are based on calculated sound pressure levels for a variety of wind speeds (*SIAS-04SPL E-92 OM 1 2.3 MW Rev1_4-eng-eng.doc* dated December, 2012). A number of input parameters summarized in Table 1 were included in the model:

A conservative and standardized approach has been incorporated into the analysis which is based on modeling individual sound levels at a mean wind speed of 8 m/s (10 m height) which is representative for the site.

Table 1: Turbine Specifications Used for Sound Modeling.

Description	Specification
Manufacturer	Enercon
Model	E-92
Hub Height	98 m
Rotor Diameter	92 m
Operation Mode	Level 1
Rated Power Output	2300 kW
Noise Operation Model	Level 1
Maximum Sound Level (nacelle)	104.4 dBA @ 8 m/s

The resultant A-weighted sound pressure levels were mapped to determine whether the wind turbine will impact surrounding receptors. A threshold level of 40 dBA is currently recognized by Nova Scotia Environment and all of the receptors were below this threshold level. The details are provided in the attached report.

Kirk Schmidt
Vice President Operations
AL-PRO Wind Energy Consulting Canada Inc.

Project:
728 Mulgrave

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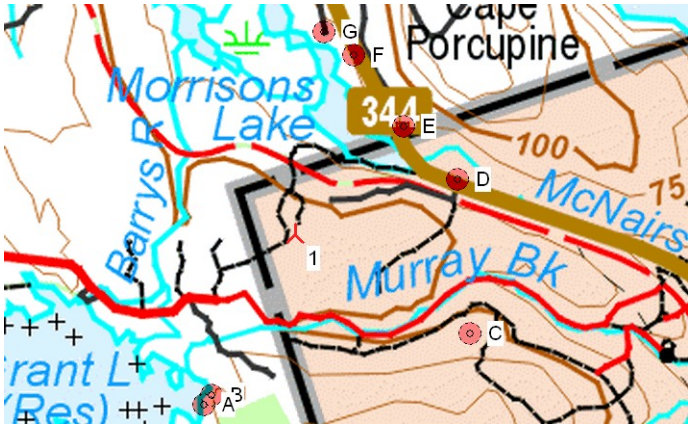
+49 (0) 4936 6986-0
Kirk Schmidt / kirk.schmidt@al-pro.ca

Calculated:
11/28/2013 4:33 PM/2.9.207

DECIBEL - Main Result

Calculation: Mulgrave Sound dBA @ 8 m/s

Noise calculation model:
ISO 9613-2 General
Wind speed:
8.0 m/s
Ground attenuation:
None
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
2.0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)



Scale 1:50,000
New WTG Noise sensitive area

WTGs

	UTM (north)-NAD83 (US+CA) Zone: 20				WTG type						Noise data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	Wind speed	LwA,ref	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	
1	622,056	5,053,081	120.0	ENERCON E-92 2,3 MW 23...	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	EMD	Level 0 - calculated - Op.Mode I - 06/2012	8.0	104.4	0 dB

Calculation Results

Sound Level

Noise sensitive area			UTM (north)-NAD83 (US+CA) Zone: 20			Demands	Sound Level		Demands fulfilled ?
No.	Name		East	North	Z	Imission height	Noise	From WTGs	Distance to noise demand	Noise
					[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Noise sensitive point:	(2)	621,476	5,051,934	121.3	2.0	40.0	31.7	713	Yes
B	Noise sensitive point:	(3)	621,520	5,052,002	124.1	2.0	40.0	32.5	632	Yes
C	Noise sensitive point:	(4)	623,228	5,052,449	107.9	2.0	40.0	31.3	759	Yes
D	Noise sensitive point:	(5)	623,121	5,053,462	70.0	2.0	40.0	33.1	561	Yes
E	Noise sensitive point:	(6)	622,756	5,053,807	71.8	2.0	40.0	34.3	443	Yes
F	Noise sensitive point:	(7)	622,419	5,054,274	77.2	2.0	40.0	32.0	682	Yes
G	Noise sensitive point:	(8)	622,218	5,054,421	68.3	2.0	40.0	31.2	784	Yes

Distances (m)

	WTG
NSA	1
A	1285
B	1205
C	1332
D	1131
E	1009
F	1247
G	1350

Project:
728 Mulgrave

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Calculated:
11/28/2013 4:33 PM/2.9.207

DECIBEL - Detailed results

Calculation: Mulgrave Sound dBA @ 8 m/s**Noise calculation model:** ISO 9613-2 General 8.0 m/s

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction

Calculation Results

Noise sensitive area: A Noise sensitive point: (2)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,285	1,289	**31.75**	104.4	3.00	73.20	2.45	0.00	0.00	0.00	75.65	0.00
Sum	31.75											

Noise sensitive area: B Noise sensitive point: (3)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,205	1,208	**32.46**	104.4	3.00	72.64	2.30	0.00	0.00	0.00	74.94	0.00
Sum	32.46											

Noise sensitive area: C Noise sensitive point: (4)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,332	1,336	**31.35**	104.4	3.00	73.52	2.54	0.00	0.00	0.00	76.05	0.00
Sum	31.35											

Noise sensitive area: D Noise sensitive point: (5)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,131	1,140	**33.09**	104.4	3.00	72.14	2.17	0.00	0.00	0.00	74.31	0.00
Sum	33.09											

Noise sensitive area: E Noise sensitive point: (6)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,009	1,019	**34.30**	104.4	3.00	71.16	1.94	0.00	0.00	0.00	73.10	0.00
Sum	34.30											

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DECIBEL - Detailed results

Calculation: Mulgrave Sound dBA @ 8 m/s**Noise calculation model:** ISO 9613-2 General 8.0 m/s

Noise sensitive area: F Noise sensitive point: (7)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,247	1,255	**32.05**	104.4	3.00	72.97	2.38	0.00	0.00	0.00	75.35	0.00
Sum	32.05											

Noise sensitive area: G Noise sensitive point: (8)

WTG **Wind speed: 8.0 m/s**

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cmet [dB]
1	1,350	1,358	**31.16**	104.4	3.00	73.66	2.58	0.00	0.00	0.00	76.24	0.00
Sum	31.16											

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DECIBEL - Assumptions for noise calculation

Calculation: Mulgrave Sound dBA @ 8 m/s**Noise calculation model:** ISO 9613-2 General 8.0 m/s

Noise calculation model:
ISO 9613-2 General
Wind speed:
8.0 m/s
Ground attenuation:
None
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
2.0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)
Octave data not required
Air absorption: 1.9 dB/km

WTG: ENERCON E-92 2,3 MW 2300 92.0 !-!
Noise: Level 0 - calculated - Op.Mode I - 06/2012

Source	Source/Date	Creator	Edited
Manufacturer	6/1/2012	EMD	12/21/2012 11:26 AM

According to manufacturer specification document "SIAS-04-SPL-E-92 OM I 2 3 MW Rev1 3-ger-ger.pdf" dated 06/2012

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
From Windcat	98.0	8.0	104.4	No

NSA: Noise sensitive point: (2)-A
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

NSA: Noise sensitive point: (3)-B
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

NSA: Noise sensitive point: (4)-C
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

NSA: Noise sensitive point: (5)-D
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

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DECIBEL - Assumptions for noise calculation

Calculation: Mulgrave Sound dBA @ 8 m/s**Noise calculation model:** ISO 9613-2 General 8.0 m/s

NSA: Noise sensitive point: (6)-E
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

NSA: Noise sensitive point: (7)-F
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

NSA: Noise sensitive point: (8)-G
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Distance demand:

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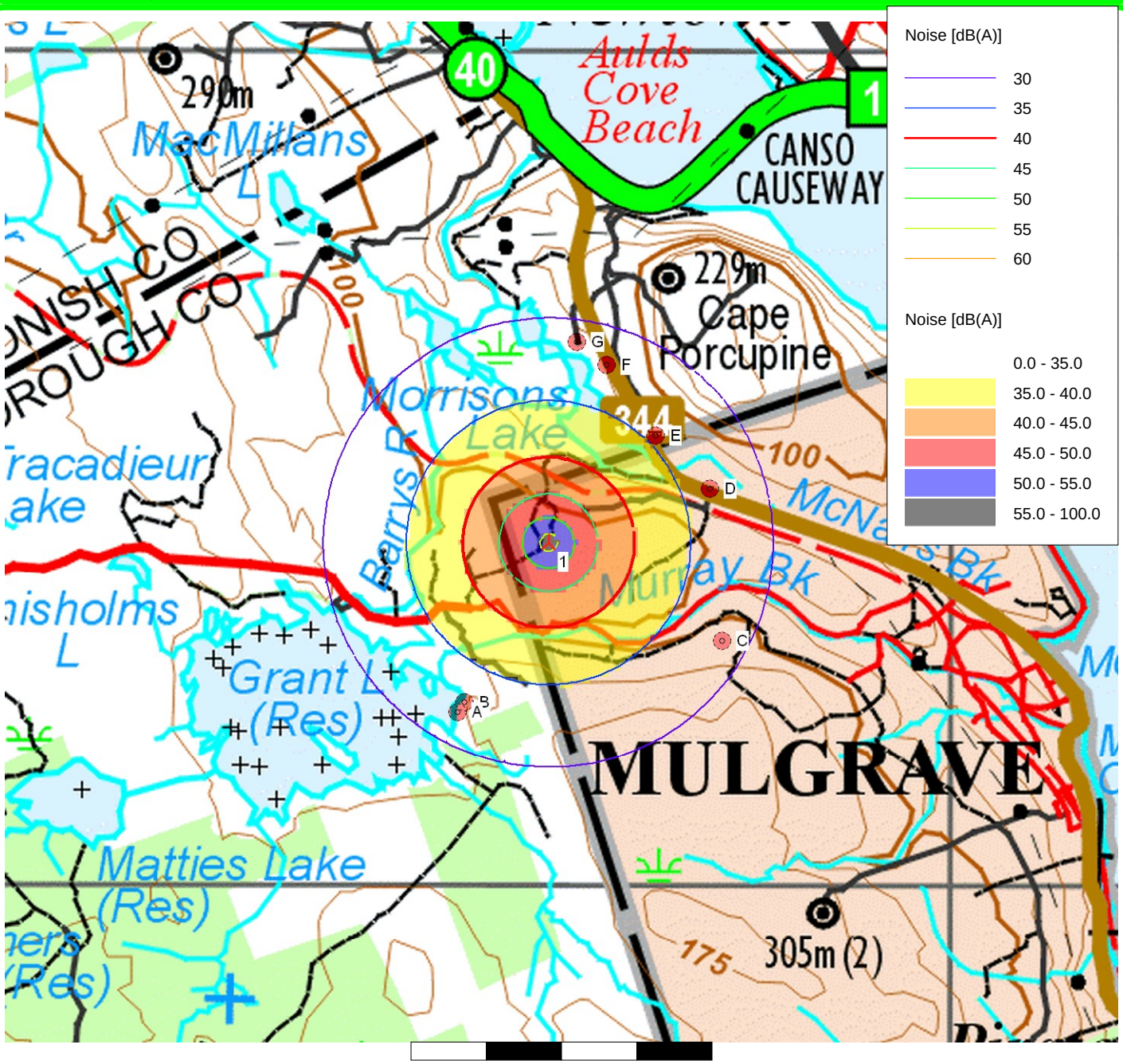
DECIBEL - Map 8.0 m/s

Calculation: Mulgrave Sound dBA @ 8 m/s**Noise calculation model:** ISO 9613-2 General 8.0 m/s



0 500 1000 1500 2000 m

Map: mulgrave_bkgrd map , Print scale 1:40,000, Map center UTM (north)-NAD83 (US+CA) Zone: 20 East: 622,056 North: 5,053,081

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8.0 m/s
Height above sea level from active line object