- # NB Department of Environment and Local Government

EIA Registration – Havelock Wastewater Collection and Treatment System

Type of Document
Final Report

Project Number
MON-00021215-A0

Prepared By:

exp Services Inc.
40 Henri Dunant Street
Moncton, NB E1E 1E5
Canada

Date Submitted
December 2014

New Brunswick Department of Environment and Local Government

EIA Registration – Havelock Wastewater Collection and Treatment System

Type of Document:
Final

Project Number:
MON-00021215-A0

Prepared By:
Robert Gallagher, P.Eng.

Reviewed By:
Gordon Wasson, P.Eng.

exp Services Inc.
40 Henri Dunant Street
Moncton, NB E1E 1E5
Canada
T: +1.506.857-8889
F: +1.506.857.8315
www.exp.com

Date Submitted:
December 2014

December 22, 2014 MON-00021215-A0

New Brunswick Department of Environment and Local Government
Project Assessment Branch (EIA)
Science and Planning Division
PO Box 6000
Fredericton, NB
E3B 5H1

Attention: Director, Project Assessment Branch

Re: **EIA Registration – Havelock Wastewater Collection and Treatment System**

Enclosed herewith are one (1) hardcopy and one (1) CD (with files in PDF format) of the EIA Registration for the above noted project. These copies are to supplement the electronic copy of the registration document only which was submitted via e-mail.

We look forward to hearing from you and if you have any questions or require additional information do not hesitate to contact me.

Yours truly,

Gordon P. Wasson, P. Eng.

cc. Jeff Russell, P. Eng. – NB Department of Environment and Local Government

40 Henri Dunant Street, Moncton, NB E1E 1E5, Canada
T: +1.506.857.8889 • F: +1.506.857.8315 • www.exp.com

Legal Notification

This report was prepared by **exp** Services Inc. for the account of the **New Brunswick Department of Environment and Local Government**.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Table of Contents

LIST OF APPENDICES

LIST OF TABLES AND FIGURES

exp Quality System Checks	
Project No.: MON-00021215-A0	Date: 2014-12-22
Type of Document: Final	Revision No.: 0
Prepared By: Robert Gallagher, M.Sc.Eng., P. Eng.	Robert S. Gallagher
Reviewed By: Gordon Wasson, P. Eng.	Gordon P Wasson

1 Proponent

1.1 Proponent Name

New Brunswick Department of the Environment and Local Government (NBDELG).

1.2 Address of the Proponent

Department of Environment and Local Government
Community Funding Branch
Marysville Place
20 McGloin Street
Fredericton, NB
E3A 5T8

1.3 Chief Executive Officer

Honorable Brian Kenny, Minister of Environment and Local Government

1.4 Principal Contact for Purposes of EIA

Jeff Russell, P. Eng. – Project Engineer
New Brunswick Department of Environment and Local Government (NBDELG)
Tel: 506-444-2654; e-mail: Jeff.Russell@gnb.ca

1.5 Property Ownership

Sanitary mains will primarily be installed along existing roadways in the community and therefore within the existing right-of-way (ROW). Wastewater will either flow by gravity or be pumped from individual pump units to the sanitary mains via service laterals installed to each property in the proposed sanitary service area. The wastewater treatment plant (WWTP) and related infrastructure will be located on the south side of Ridge Brook and in the central portion of the property currently identified by property identification number PID 00060665. An easement will also be required for the sewer piping which will convey wastewater from Route 885 to the treatment plant.

The following summarizes property ownership related to the project:

Wastewater Treatment Plant Site: A portion of the property presently owned by Graymount (NB) Inc. (PID 00060665). The Province of NB has an option to purchase a portion of the property for the treatment facility.

Sanitary Sewer Mains along Roadways: Province of New Brunswick Department of Transportation and Infrastructure.

Sanitary Sewer Mains (Easements – Option 1): Easements across PID 00060780 and, PID 00167304.

Sanitary Sewer Mains (Easements – Option 2): PID 00170605 and, PID 00167304.

Sanitary Sewer Mains (Easements – Option 3): PID 00060780 and, PID 00167304.

2 The Undertaking

2.1 Name of the Undertaking

Havelock Wastewater Collection and Treatment System.

2.2 Project Overview

The community of Havelock is situated approximately 7 km north of NB Route 2 in the northeast corner of Kings County and approximately 45 km from Moncton. The current population in the study area is estimated to be about 365 persons living in approximately 150 dwelling units. Local economic activity centres around the limestone industry. Cement production was a major economic activity until about the mid-1990s.

Currently, the community is serviced by a series of on-site wastewater treatment systems and private potable water supply wells. Many of the on-site sewage disposal systems do not meet current regulations as outlined in NB Regulation 2009-137 under the *Public Health Act* and there is some evidence that a few of the existing systems are failing to provide adequate wastewater treatment. This is due to many factors, including the fact that many of the systems were constructed before current and several previous regulations came into effect. A number of these inadequate treatment systems are located in the heart of the community, where most properties have an area less than the minimum lot size of 0.4 ha (1 acre) prescribed by current regulations. Furthermore, it is noted that many properties are located in proximity to watercourses which further limits the amount of available land to site an on-site disposal system.

As a result of the current situation, the New Brunswick Department of the Environment and Local Government (NBDELG) is proposing to construct a wastewater collection and treatment system to service the core area of development. In general terms, this will involve the installation of approximately 6.7 km of sewer main; approximately 145 sanitary service lateral connections; and a new wastewater treatment plant (WWTP). The majority of the sanitary service connections will be to residential properties. Sewer easements will be required for the inlet piping to the WWTP, and there are currently three general alignment options under consideration as illustrated on the preliminary site plans provided in Appendix A. Similarly, two options are currently under consideration for the access road to the proposed WWTP as indicated on the above noted preliminary site design site plans. The actual project easement requirements and the final alignment of the WWTP access road will be determined during the detailed design process.

The area to be serviced is generally characterized by gently rolling topography and a shallow depth to bedrock which cannot be readily excavated with an excavator. As a result, a portion of the new sewer mains will be pressure sewers which will eliminate the requirement for large pumping stations and minimize rock excavation requirements. Small pumping stations will be required to pump wastewater from individual properties to the sanitary main for each property to be serviced in the pressure sewer zones. Once the main line collection and treatment systems are constructed, individual properties will then be connected to the system. As part of their connection, septic tanks will be pumped out and decommissioned.

Since the project will involve construction within 30 m of area watercourses, a Watercourse and Wetland Alteration (WAWA) Permit will be required under the Provincial WAWA regulations.

2.3 Purpose/Rationale/Need for the Undertaking

Market Potential: Not applicable.

Benefit to Society: The project will result in a net positive impact on society and the environment, since existing wastewater treatment in the community is generally inadequate as described above in **Section 2.2**. The new communal WWTP will be designed in accordance with current standards and regulations, and the effluent from the plant will therefore meet current requirements which will result in a reduced impact on area ecological receptors and a reduced potential for adverse impacts on human health. Finally, the construction of a centralized wastewater collection and treatment system is expected to lead to better long term management of wastewater discharge in the community since the system will be operated and maintained by certified operators.

Economic Benefits: In the long term, it is anticipated that the proposed undertaking will promote an environment for future commercial development in the study area since the presence of a centralized wastewater collection and treatment system is generally considered to be a pre-requisite for larger scale commercial enterprises.

Job Creation Benefits: Job creation will include short term construction related jobs. In the long term, it is expected that one or two operators will be required on a part-time basis to operate and maintain the system.

Consumer and/or Industrial Demand: See above.

Discussion of Alternatives: The " do nothing" alternative is not considered to be acceptable due to public safety and ecological concerns associated with the status quo in which much of the community is serviced by on-site sewage disposal systems which have not been designed and constructed in accordance with current standards and/or are potentially malfunctioning. The current situation is exacerbated by the fact that the study area is also serviced by private domestic potable water wells that are potentially susceptible to contamination from inadequately treated or untreated wastewater effluent.

2.4 Project Location

Location/PID: As previously indicated, the project will involve the construction of approximately 6.7 km of new gravity or pressure sewer. The new sewer mains will generally be constructed within the right-of-way (ROW) limits of existing roadways for which there are no associated provincial property identification numbers (PID). The roads fall under the jurisdiction of NB Department of Transportation and Infrastructure. Sewer mains will be constructed along a number of local roads including NB Route 885; NB Route 880; Back Street; Cross Street; Garland Street; and Maple Street. Sewer easements will also be required to allow for the construction and maintenance of conveyance piping to the new WWTP. The new treatment plant will be constructed on the south side of Ridge Brook in the central portion of the property currently identified by PID 00060665.

The proposed work area is situated within the Community of Havelock which is located in the Parish of Havelock, Kings County. The overall project location in a regional context is provided on Figure 1.

Address: The new sewer mains will primarily be constructed within existing roadway ROW for which there is no associated PID number or civic address. The new treatment plant will be constructed in the central portion of a large (i.e. 28 ha) undeveloped and partially tree covered parcel of land with no civic address and identified by PID 00060665.

Location Map: The project location relative to communities, roads, environmental features, etc., is indicated on Figure 2.

2.5 Siting Considerations

Due to the nature of the project, there are limited opportunities to examine alternate locations for the proposed infrastructure. The majority of the sewer mains will follow the existing roadways along the properties which they are intended to service, and the WWTP will need to be located in proximity to the watercourse which will serve as the ultimate point of discharge of the treated effluent. Since the Havelock Local Service District (LSD) does not currently own any property adjacent to watercourses, the proponent currently has an option to purchase a portion of land from the land parcel identified by PID 00060665 for the siting of the WWTP related infrastructure. This portion of land is located on the south side of Ridge Brook. The proposed WWTP location is in a wooded area which is remote from any sensitive land uses (e.g. residential, schools, etc.) or water wells. Options are currently under consideration for the location of the required sewer easements to allow for the construction of the approximately 900 m of sewer inlet piping to the treatment plant.

The GeoNB Mapviewer on-line mapping tool does not indicate the presence of any regulated wetlands in the general vicinity of the proposed infrastructure developments. Based upon this screening evaluation, it is anticipated that the project will not require any work within 30 m of a wetland.

Exp consulted the Archaeological Services Unit of the New Brunswick Wellness, Culture and Sport regarding the potential of encountering heritage or cultural resources in the study area. The archaeological services unit indicated that there was a low risk of encountering heritage resources in the area based upon their existing information and internal archaeological predictive modeling.

There has been no consultation with the Regional Service Commission (RSC) #8 planning authority concerning this project.

2.6 Physical Components and Dimensions of the Project

A property plan and aerial photograph indicating the location of the key physical components of the project and surrounding relevant features is provided as Figure 2. Site plans indicating the conceptual layout of the wastewater collection and treatment system are provided in Appendix A. It is noted that the project is currently in the preliminary design phase, and that the final layout of the sewer mains, treatment plant infrastructure and related components will be finalized during the detailed design phase. However, it is expected that the final design details will not vary significantly from the preliminary design information outlined herein.

2.6.1 Wastewater Treatment System Technology Description

It is proposed to utilize an engineered wetland technology originally developed in Germany in the early 1970s by Dr. Reinhold Kickuth for wastewater treatment. This proprietary technology involves treating wastewater in a lined bed containing an engineered soil matrix. Abydoz Environmental Inc. of Portugal Cove-St. Philips, NL holds the local licensing rights for this technology.

Technical background information on the Abydoz engineered wetland treatment system is provided in Appendix B. Additional operational details on this treatment system are provided in **Section 2.8.1**.

2.6.2 Site Dimensions

Based upon the current preliminary design information, a land parcel with dimensions of 200 m x 200 m and an area of approximately 4 ha will be required for WWTP and related infrastructure as indicated on the conceptual site plans in Appendix A.

2.6.3 Physical Components

The key physical components of the treatment plant are as follows:

- Primary settling tanks;
- Wastewater flow measuring device;
- Flow splitting weir assembly;
- In-ground wetland beds complete with reed plants, engineered soil matrix and associated distribution piping;
- UV disinfection chamber housed in a small treatment building.

A water well will also be drilled on the treatment plant property to supply non-potable water for operational use such as washing down equipment. The required well yield will be approximately 33 m^3/day (5 lgpm) which is less than the 50 m^3/day (7.6 lgpm) trigger for assessment under the provincial EIA process.

In addition to the treatment plant, the project will include the installation of approximately 6.7 km of sewer main. Although the actual breakdown will be determined during final design, the proportion of the collection piping which will be gravity sewer and small diameter pressure sewer at the current preliminary design stage is approximately 60% and 40%, respectively. Manholes typically spaced at 100 m will be required for the gravity sewer zones.

Wastewater grinder pumps (GP), pumping chambers and related pump controls will also be required for each property serviced by pressure sewers and several properties in the gravity zones with grading issues. The electrical control panels are typically mounted in the basement of each on-site residence. In a GP pressure sewer system, the raw effluent flows by gravity from the household or business to the GP pumping chamber.

Larger pumping chambers or wet wells equipped with grinder pumps will be installed at the end of Maple and Garland Streets which currently have nine and five households, respectively. Wastewater from along these streets will be collected by gravity sanitary laterals which will flow by gravity to the wet well at the end of the street which, in turn, will pump the effluent via a forcemain to the pressure sewer along NB Route 880.

2.6.4 Off-site Facilities Affected

The Abydoz engineered wetland technology is not expected to result in a large amount of sludge accumulation. However, any waste sludge from the treatment process will be disposed of at a Provincially approved septage receiving station.

2.7 Construction Details

Approximate Duration: the project timelines are tight and an outline of the currently anticipated project schedule for the 2015 construction season is provided below:

Issue project tender package – April, 2015
Tender closing and award – May, 2015
Construction start date – May, 2015

It is estimated that approximately twenty-five (25) weeks will be required for construction in 2015 (i.e. May, 2015 to November, 2015).

It is anticipated that some additional construction will take place during the 2016 construction season to finalize the project, since the wetland will likely need to be constructed and operational prior to making the final sanitary service connections.

Estimated Hours of Construction: the estimated working hours during the construction period are as follows: 7:00 hr to 19:00 hr, 5 days per week, Monday to Friday.

Anticipated Equipment: excavators, front end loaders, flat-bed trucks, dump trucks, concrete trucks, bulldozers and compaction equipment. Ancillary equipment would include municipal infrastructure piping installation equipment.

Date of First Physical Construction-related Activity: construction is tentatively scheduled to commence in late May, 2015. Construction timelines are tight as it is anticipated that the duration of the work will encompass the majority of the 2015 construction season.

Potential Sources of Pollutants: fugitive dust emissions, noise, suspended solids runoff, spillage of fluids used in equipment such as hydraulic fluid and fuels.

Fate of Wastes: wastes associated with the project are expected to include construction debris primarily related to equipment and supplies packaging. Where not recycled, this material will be removed from the site and landfilled at a regulatory approved facility. Portable toilets will be provided on-site for construction workers and these units will be serviced as required by a qualified sub-contractor.

Access and Traffic Management: it is expected that one lane of traffic will be maintained during the installation of new pipework on existing roads in the community for the majority of the construction period. The contractor will be required to adhere to requirements outlined in the New Brunswick Department of Transportation and Infrastructure (NBDTI) Work Traffic Control Manual. The existing access road to the proposed WWTP site will also be upgraded as part of the current work, or possibly another access road alignment will be used as indicated on Drawing 9-4 in Appendix A. Much of the latter alignment follows an existing road which would have to be upgraded, and new construction would be required for the last section of this alignment.

Clearing and Grubbing: some clearing and grubbing will be required to accommodate the construction of the wastewater treatment related infrastructure and the inlet piping to the treatment plant. However, it is noted that much of this area is lightly tree covered with alders and other low bush woody vegetation. The contractor will be responsible for the disposal of grubbings in an approved manner and take ownership of any merchantable timber. No clearing or grubbing activity will be required for the remainder of the project (i.e. installation of sewer mains along existing roadways).

Fill Material: clean common fill, granular pipe bedding and standard aggregate (sub-base and base) for roadway re-instatement will be required.

Work Near Wetlands/Watercourses: as previously indicated, no regulated wetlands were identified in the project area on the GeoNB Mapviewer on-line mapping application. Therefore, it is anticipated that the project will not involve any work within 30 m of a wetland. However, the construction of the WWTP and related infrastructure will involve some disturbance of the ground surface within 30 m of Ridge Brook. All necessary permits and approvals will be obtained prior to initiating the work as previously discussed herein. The sewer main crossings of Keith Brook on the west side of NB Route 880 (i.e. Lower Ridge Road) and the unnamed watercourse on the east side of NB Route 880 will likely be constructed by directional drilling, and will therefore not involve any work within 30 m of a watercourse. No other work within 30 m of a watercourse will be completed.

2.8 Operation and Maintenance Details

2.8.1 Key Features of the Operation

The wastewater will flow to the treatment facility by a combination of gravity sewers and pressure sewers. On entering the treatment facility, the effluent will enter a series of settling tanks, where the majority of suspended solids will be removed by gravity and settle in the chambers. From the settling tanks, the flow will be split by a weir arrangement that allows the flow to move into the engineered wetland treatment beds. The inlet piping in the treatment beds flows down the centre of the beds with discharge piping along both sides of the beds. The inlet piping is typically housed in a series of infiltrator chambers. The outlet piping from the treatment beds will then direct flow to the ultra-violet (UV) light treatment building for disinfection. The disinfected influent will then flow by gravity through the outfall piping to Ridge Brook.

As previously mentioned, the Abydoz wetland system is based on sub-surface/root zone flow whereby wastewater is treated in a lined bed containing an engineered soil matrix. Reed plants are used to transfer oxygen to the soil matrix fostering aerobic microbiological activity which is used to biologically and chemically break down contaminants. The treatment area is a stable, engineered ecosystem and is based on complex interrelationships between plants, soils and micro-organisms.

The wetland system provides for continuous treatment of wastewater and does not require any chemical addition. Power requirements at the treatment plant would be limited to the UV lamps as the effluent will pass through the treatment beds by gravity flow. Operator requirements are low, and no specialized training is required. However, it is noted that the settling tanks will require regular cleaning (e.g. once every six to twelve months). It is also noted that the engineered wetland is a modular type design wherein additional treatment beds can be readily added to treat increased future flows.

2.8.2 Capacity of Pumps/Pipelines Carrying Water

Based on preliminary design work, the estimated average daily design flow of the treatment facility is 238,000 LPD. The gravity portion of the collection system will generally consist of 200 mm diameter sewer piping; 100 mm diameter service laterals to homes; and concrete manholes complete with cast iron frames and covers. The pressure sewer portion of the collection system will consist of 75 mm diameter forcemain in addition to grinder pumps and chambers for each serviced residence or business. Two small lift stations/duplex wet wells equipped with grinder pumps will also be located at the end of Maple and Garland Streets.

2.8.3 Number of Employees

Operation and maintenance of the wastewater collection has yet to be determined; it will either be carried out by trained operators from a nearby municipality or contracted out to a private firm experienced in this service. It is anticipated it will require one or two operators on a part-time basis.

2.8.4 Period of Operation and Number of Shifts

The treatment system will operate continuously; however, there will not be regular monitoring by the operations staff. The system is being designed to operate with minimal requirement for operation and maintenance activities. It is anticipated that employees will routinely visit the plant and the two small lift stations/wet wells during the week to check on the system and perform any routine maintenance that may be required.

2.8.5 Estimated Life Span of Treatment System

Abydoz reports an expected life span of 60 years for the engineered wetland. Lift stations have a typical service life of a minimum of 25 years and possibly much longer if they are properly maintained. The expected service life of the grinder pumps are on the order of 15 to 20 years under normal service conditions.

2.8.6 Descriptions of Material Storage Locations

There will be minimal requirements for material storage since the operation and maintenance of the treatment facility will not require the addition of any chemicals. However, a small storage shed for housing tools and maintenance equipment may be located on the treatment plant site.

2.8.7 Project Energy Requirements

According to literature provided by Abydoz, the engineered wetland does not require any power for the treatment system itself. Project power requirements would be limited to the UV disinfection system and individual pump units connected to the pressure sewer system.

Regarding individual pump operation, the estimated annual cost to operate each pump is $25 to $35 for an average family household. However, these costs would be offset by savings associated with not having to provide septic system maintenance.

Since the project is currently in the preliminary design stage, we do not have enough information to provide detailed energy requirement estimates.

2.8.8 Point of Discharge into Receiving Environment

A new effluent outfall will be constructed to convey treated effluent to Ridge Brook.

2.8.9 Streamflow and Anticipated Dilution Factor

Unfortunately, there are no Environment Canada or other stream gauging stations located along Ridge Brook. Therefore, the Ridge Brook streamflow was estimated at the proposed point of the treatment plant discharge by pro-rating historical streamflow data for Palmers Creek at Dorchester, NB based on drainage area estimates for both streams. Palmers Creek was selected for comparison as it is a similar watercourse located in the same geographic (i.e. southeastern NB) region as Ridge Brook. Furthermore, the estimated drainage areas for Ridge Brook at the WWTP and Palmers Creek at Dorchester are similar in magnitude (48.6 km^2 and 34.2 km^2, respectively).

Using the above approach and the average daily low flow value for Palmers Creek over the 18 years of record (1967-1985), a daily low flow estimate of 0.0199 m^3/s was calculated for Ridge Brook at the point of discharge. Therefore, using the above low flow estimate and the design flow of 238,000 LPD for the wastewater treatment plant, a dilution factor of approximately 25:1 was calculated which exceeds the minimum value of 8:1 recommended by NBDELG.

2.8.10 Mixing Zone

The outfall from the treatment plant and disinfection facilities will discharge to Ridge Brook with no "defined" mixing zone other than the brook itself.

2.8.11 Disinfection Facilities

Provision for ultra-violet (UV) disinfection of the treated effluent prior to discharge to the receiving stream will be accommodated in the design. UV disinfection eliminates the need for storage of potentially hazardous chlorine products in addition to the requirement for any subsequent de-chlorination. The operation of the UV disinfection system (i.e. year round versus seasonal) will be as defined in Certificate of Approval to operate the treatment system.

2.8.12 Nominal Capacity at Facility Start-up

The design capacity of the proposed treatment plant will be 238,000 LPD, based upon a design population of 700 persons. The normal operating flow at start-up is expected to be on the order of 124,100 LPD based on the current population of the service area which is about 365 persons and an assumed per capita flow rate of 340 L/cap.d as recommended in the Atlantic Canada Wastewater Guidelines Manual (Environment Canada, 2006).

Based on a peaking factor of 3.9 as determined by the Harmon formula, the design peak flow was calculated to be 928,200 LPD (Environment Canada, 2006).

2.8.13 Discharge Mode (Batch or Continuous)

The proposed treatment system will operate in continuous flow mode although there will be the typical diurnal fluctuations in flow.

2.8.14 Pump/Lift Stations Required

As previously mentioned, a pumping chamber equipped with a grinder pump will be required for each property to be serviced in the pressure sewer zones in addition to other properties in the gravity zones for which a pump will be required due to lack of adequate positive grade to the sewer main. A small lift station/wet well will also be required at the ends of both Maple and Garland Streets. It is likely that the lift stations will be equipped as duplex units. Wastewater from the houses along these streets will be collected by gravity and transported to the lift stations by gravity flow. The effluent from each lift station would then be pumped via a forcemain to the pressure sewer along NB Route 880.

An estimated total of approximately 135 sanitary lateral connections will be required for the project. At the current preliminary design stage, approximately 55% of the connections will be forcemain laterals and 45% will be gravity laterals. The final proportion of sanitary and forcemain laterals may vary as a result of the detailed design process.

2.8.15 Design Characteristics of Treated Effluent

The design characteristics of the treated effluent will be in accordance with the Wastewater Systems Effluent Regulations under the federal Fisheries Act. As such, the design effluent requirements are as follows:

- BOD_5 <25 mg/L;
- TSS <25 mg/L;
- Un-ionized ammonia (NH_3-N) <1.25 mg/L;
- Total residual chlorine <0.02 mg/L; and,
- Effluent must be non-toxic.

In addition, disinfection will be required prior to discharge of the treated effluent to the receiving stream.

2.8.16 Design Characteristics of Raw Influent

The design characteristics of the raw influent are representative of medium strength municipal wastewater and are as follows:

- BOD_5 = 200 mg/L;
- TSS = 220 mg/L; and,
- Un-ionized ammonia (NH_3-N) = 30 mg/L.

It is noted that the raw influent will not contain any residual chlorine as disinfection will be provided by UV lamps as previously noted in **Section 2.8.11**. It is also noted that nearly all of the wastewater collection and treatment service connections will be residential properties.

2.8.17 Operation and Maintenance Targets

Operation and maintenance requirements for the treatment system include: labour, electrical (power consumption and maintenance), mechanical maintenance (parts) and sludge management. As required, operators will collect wastewater samples in accordance with the Approval to Operate and have them analyzed by an outside laboratory. The analytical results will be included in reports submitted to the New Brunswick Department of Environment and Local Government (NBDELG), as required.

To protect against damage to the wetland or other components of the treatment system or ecological impacts, a by-law regulating the discharge of water or wastewater into the sanitary sewer system will be developed by the Havelock LSD. This by-law will set discharge limits for selected parameters (e.g. BOD_5, etc.) for any wastewater entering the system and include a list of substances (e.g. petroleum hydrocarbons, radioactive materials, etc.) which cannot be discharged to the sewer system in order to protect the treatment system and/or the environment.

2.8.18 Disposal of Sludge

Since decomposed biological solids will become part of the plant bed in the proposed Abydoz engineered wetland system, the sludge to be removed from the treatment systems will be limited to primary solids and/or screenings. For preliminary estimation purposes, a rough estimate of the quantity of sludge produced can be calculated as the amount of TSS removed from the system per day. However, it should be noted that this approach results in a conservative estimation of sludge volume since the estimate would include both primary solids and biological material. Furthermore, it is noted that it is not possible to determine what fraction of the sludge quantity will be primary solids and what fraction will be biological given the information currently available.

Based on the above noted approach, the volume of sludge to be removed is estimated to be 24.2 kg/d (dry weight). A summary of the assumed influent and effluent data is provided below.

- Influent TSS concentration = 220 mg/L
- Effluent TSS concentration = 25 mg/L
- Removal = 88.6%
- Daily flow = 124,100 LPD
- Influent TSS loading = 27.3 kg/day
- TSS mass removed = 24.2 kg/day

For preliminary design purposes, it is estimated that approximately 50%-60% of the influent solids will be captured by the primary settling tanks.

2.8.19 Maintenance Responsibility

As previously mentioned, it is anticipated that a nearby municipality or a private firm qualified in treatment plant operations will be engaged to operate and maintain the new wastewater collection and treatment system. Details with respect to the maintenance of individual pump units have yet to be determined.

2.9 Future Modifications, Extensions, or Abandonment

Given that the population growth rate of the service area is relatively low and that the system is being designed to accommodate some future growth, the requirement for any modifications or extensions of the collection and treatment system in the near future is not envisioned. However, it is noted that the proposed Abydoz engineered wetland system has a modular type design which can readily accommodate the treatment of increased future wastewater flows, if necessary.

The treatment system will be decommissioned at the end of its design life in accordance with the regulatory requirements in effect at the time of decommissioning.

2.10 Project Related Documents

The following project related documents are available:

i) ADI Limited (an **exp** heritage company), 2005. Water and Sewer Study – Community of Havelock. Final report to Havelock Local Service District dated May, 2005. ADI File No. (8) 5604-001.1.

ii) ADI Limited (an **exp** heritage company), 2007. Wastewater Collection and Treatment Study – Community of Havelock. Draft report to the New Brunswick Department of the Environment dated July, 2007. ADI File No. (80) 1852-041.1.

Copies of the above noted supporting documentation have been included with the electronic version of the EIA registration submission. However, please note that these documents only contain preliminary/conceptual design information, and that the information provided in the current registration document supersedes some of the technical information in these reports.

3 Description of the Existing Environment

3.1 Physical and Natural Features

3.1.1 Topography and Surface Water Drainage

The topography of the Havelock area is typically defined by gently to moderately sloping terrain with hills and ridges. The slope of the existing ground surface is typically in the 3% to 7% range. A large ridge is located along the south side of the proposed sanitary sewer service area. The total topographic relief between this ridge and Ridge Brook near the proposed WWTP is on the order of 55 m.

Ridge Brook which flows through the community in an approximate southwest to northeast manner is the primary watercourse in the proposed service area. Keith Brook and an unnamed stream traverse NB Route 880 as they flow from the local topographic high area towards Ridge Brook. From the Havelock area, Ridge Brook flows northeast and then north before discharging to the Canaan River.

3.1.2 Geology and Hydrogeology

In the central portion of the community, the regional overburden geology is comprised of a 0.5 m to 3 m thick blanket of loamy lodgement till, minor ablation till, silt, sand, gravel and rubble (Rampton et al., 1984). West and south of this area, the above noted unit exists as a discontinuous veneer over bedrock and, where present, it is generally less than 0.5 m thick. Immediately surrounding some area streams, the above noted till units are overlain by a layer of sand, some gravel and silt, rare clay and patchy thin veneer of organic sediment (Rampton et al, 1984). The latter unit is also discontinuous and, where present, it is generally less than 0.5 m thick.

Based on the completion of some preliminary geotechnical boreholes associated with the proposed undertaking, the overburden soil in the proposed sewer service area are typically comprised of a thin layer of reddish brown silty sand and gravel till which is generally only a few metres thick. Occasional bedrock outcrops are also located in the study area.

Concerning the regional bedrock geology, the central portion of the community is underlain by limestone which, in turn, is typically underlain by sandstone with occasional conglomerate (Potter et al., 1968). Outside of this area, the regional bedrock geology is comprised of red to grey sandstone, conglomerate and shale with minor limestone and volcanic rocks (Potter et al., 1968). A relatively small area generally categorized as red to grey conglomerate and siltstone in addition to volcanic flows, tuffs and related intrusive rocks is also located in the western portion of the study area.

As previously mentioned, the study area is serviced by private potable water supply wells completed in the underlying sedimentary bedrock aquifer. The average well yield based on a review of water well records in the NBDELG water well database for thirty area wells was reported to be 54 m^3/day (8.3 lgpm) in a previous communal water and sewer study completed by **exp**/ADI (ADI, 2005). In general, the natural groundwater quality in the community is characterized by elevated pH, hardness, calcium and manganese with occasional occurrences of elevated concentrations of other metal parameters (ADI, 2005). It is also noted that several area domestic wells were historically impacted with petroleum hydrocarbons, although the exact source of the contamination was not definitively determined (ADI, 2005).

3.1.3 Potential Adverse Environmental Conditions

There are no known existing adverse environmental conditions associated with the proposed undertaking.

3.1.4 Watercourses and Wetlands

As previously mentioned, Ridge Brook traverses the northern portion of the study area roughly in a southwest-northeast trending fashion. An outfall to this watercourse which will allow for the gravity discharge of treated effluent from the treatment plant will be required as part of the proposed undertaking and, therefore, a permit will be required under the provincial Watercourse and Wetland Alteration (WAWA) Regulation. Existing culverts are located at two locations along NB Route 880 where the roadway is traversed by tributaries to Ridge Brook. At this time, it is planned to install the gravity and/or pressure sewers at these locations by directional drilling to avoid disturbing these existing streams and related culvert crossings. Therefore, a WAWA permit will likely not be required for this portion of the work.

Based on a review of the GeoNB Mapviewer on-line mapping application, there are no regulated or provincially significant wetlands in the area of proposed work.

3.1.5 Receiving Stream

The receiving stream for treated wastewater effluent is Ridge Brook. In the Havelock area, the brook is typically surrounded by a buffer of trees and/or small woody vegetation with some open fields adjacent to it in some areas. The watercourse flows northeast through the community, then north before discharging to the Cannan River. There are no known significant economic or recreational uses of the watercourse in the study area.

3.1.6 Significant Fish/Wildlife Populations or Habitat

The Atlantic Canada Conservation Data Centre (ACCDC) was requested to search their databases for a 5 km buffer around the central portion of the proposed sanitary sewer service area to complete a screening level assessment of the nature and extent of potential ecological receptors in the study area. The results of the ACCDC data request are provided in Appendix C. It is important to note that this data only provides information on the potential presence of rare flora or fauna in the vicinity of the proposed areas of development.

The 5 km buffer contained fifteen (15) records of six (6) vascular and two (2) non-vascular flora. Similarly, eleven (11) records of six (6) vertebrate fauna and no records of intertebrate fauna were identified. Wood turtles were not noted to be present in the study area. The above noted flora and fauna observations within the study area were assigned proximity estimates ranging from 0.3 km ± 0 km to 4.7 ± 7 km. Finally, the records review identified zero (0) managed areas (MAs) and one (1) Environmentally Significant Area (ESA). Managed areas typically have some degree of protected status and ESAs may or may not have legal status. The identified ESA is a rich hardwood forest including five butternut trees located on a gypsum outcrop known as Havelock Ridge and formerly known as Butternut Ridge. This ESA is removed from the proposed work area and situated about 2.4 km north-northwest of the central portion of the community and about 800 m east of NB Route 885.

With the exception of the butternut tree for which six observations were noted, no species classified as endangered under the Provincial *Endangered Species Act* were identified in the ACCDC data. However, it is noted that there are no known butternut trees located within the proposed construction areas. It is expected that most of the butternut records in the ACCDC data relate to the above noted

Havelock Ridge ESA which is located about 2.4 km north of the central Havelock area and outside of the proposed work area. The proximity estimates for the six butternut tree observations ranged from 0.4 km ± 1.0 km to 2.2 km ± 1.0 km.

3.1.7 Environmentally Sensitive Areas

The results of the ACCDC records review within 5 km of the proposed undertaking did not reveal the presence of any environmentally sensitive areas in proximity to the area of proposed work (see above).

3.2 Cultural Features

As previously mentioned in **Section 2.5**, the Archaeological Services Unit of the New Brunswick Department of Wellness, Culture and Sport (NBWCS) was requested to conduct an archaeological screening of the proposed undertaking based on their internal files and archeological predictive modeling. Based on the results of the screening assessment, it is expected that there will be a low risk of encountering heritage resources in the study area during the completion of the proposed work.

In addition to the above noted screening, it is noted that there are no known cultural features in the immediate vicinity of the proposed construction areas.

3.3 Existing and Historic Land Uses

Since the study area is underlain by extensive deposits of high quality limestone, the manufacturing of cement, calcined lime, agricultural lime and aggregate materials has been the dominant local economic activity for several decades. Limestone from quarries in the area operated by Graymont (NB) Ltd. is used for the production of agricultural limestone, chemical lime, general construction stone and related limestone products. A cement plant also operated in the area from the 1960s until the early 1990s. In addition to the quarrying of limestone and/or the manufacturing of limestone products, agricultural activity has also historically been a mainstay of the local economy.

Aerial photographs of the study area taken in 1953, 1963, 1976, 1982 and 1993 were obtained from the New Brunswick Department of Natural Resources (NBDNR) to assist in assessing historical land use in the study area. A review of the above noted air photo record confirmed the historical predominance of agricultural and limestone related economic activity in the study area. Where shown, the proposed treatment plant site is interpreted to have been agricultural and/or undeveloped treed land over the examined time period. It is also noted that the local road network in the 1953 photograph is identical to the current road network. The overall level of development in the study area is shown to very gradually increase from the mid-1950s to the mid-2000s.

3.4 Ownership of Adjacent Properties

Site plans identifying the location of the proposed WWTP site along with the three options under consideration for the alignment of both the access road and sanitary sewer main inlet piping to the WWTP are provided as Figure 3a, 3b and 3c. Properties adjoining the access road and sanitary sewer main alignments are identified in each of these figures and the Service New Brunswick (SNB) property identification number (PID) for each adjoining land parcel by easement option is provided below in Table 1. Land ownership information for the abutting land parcels is not provided in this table in consideration of Provincial privacy related regulations, guidelines and policies.

Table 1

PID Numbers for Abutting Property by Easement Option

Dwg #	PID
Proposed Easement Option #1	
1	00060780
2	00168062
3	00167304
4	30067466
5	00060665
Proposed Easement Option #2	
1	00170605
2	00167304
3	30067466
4	00060665
Proposed Easement Option #3	
1	00060780
2	00168062
3	00167304
4	30067466
5	00060665

3.5 Presence of Known or Suspected Environmental Contamination

The New Brunswick Department of the Environment and Local Government (NBDELG) commissioned a number of studies to assess the magnitude and nature of the contamination of a number of domestic wells in the Havelock area with dissolved phase petroleum hydrocarbons. In the mid-1990s, more than a third of the wells sampled in the core of the community were impacted to varying degrees with petroleum hydrocarbons. The main hydrocarbon plume was located near the intersection of NB Route 880 and Cross Road. Another smaller plume was located slightly to the west and on the south side of NB Route 880. The level of hydrocarbon impacts was monitored on a regular basis and determined to be relatively consistent over the period of investigation. Consequently, point of use activated carbon water treatment systems were installed in a number of homes in the affected area and a few new water supply wells were drilled. The exact source or sources of the contamination could not be definitively identified based on the completed investigative work. It is noted that a number of properties in the impacted area are associated with existing or former petroleum storage tanks, including a former gasoline service station.

Since most of the known historical hydrocarbon contamination is localized to the central portion of the community and is primarily limited to groundwater, it is considered unlikely that significant quantities of contaminated soil will be encountered during the installation of the sanitary sewer mains. Furthermore, the WWTP will be located on a land parcel that is believed to have been previously undeveloped. However, it is noted that any hydrocarbon or other environmental contamination encountered during construction will be managed in accordance with the NBDELG Guidelines for the Management of Contaminated Sites (NBDELG, 2003).

4 Summary of Environmental Impacts

In general terms, potential environmental impact considerations associated with wastewater collection and treatment projects including socio-economic factors are sediment and erosion control; avoidance of any species at risk and/or environmentally sensitive areas; odour control; avoidance of heritage resources; minimization of noise and air quality impacts during construction; and traffic management and mitigation of construction related impacts to adjoining properties and businesses. Project specific considerations include avoidance of watercourse impacts related to the construction of the effluent outfall to Ridge Brook and the nearby engineered wetland; and the sewer crossings of Keith Brook and an unnamed watercourse along NB Route 880. As previously mentioned, it is currently anticipated that the watercourse sewer crossings will be accomplished by directional drilling to minimize potential watercourse impacts. However, a permit under the Provincial WAWA regulations will be required for all construction activity within 30 m of Ridge Brook.

As previously indicated in **Section 3.1**, there are no known species at risk that will be disturbed by the project or designated environmentally sensitive areas located in proximity to the proposed work. Regarding odour potential, it is noted that the proposed technology relies on aerobic biological activity to treat the wastewater. Well-operated aerobic treatment systems generally do not have a strong odour.

Any minor odours produced will be localized to the treatment plant and it is expected that they will not be detectable by nearby residents under normal operating conditions. Furthermore, it is noted that the waste sludge (i.e. primary solids) will accumulate in properly designed vessels and the sludge will be disposed of at an approved facility on a regular basis. Experience has shown that odour levels associated with the grinder pump chambers are negligible as any odours are absorbed by the soil surrounding these buried units.

It is noted that possibly other than construction activity within 30 m of a watercourse, the same potential project-environment interactions would typically be expected for future operation and maintenance activities associated with the completed project. Concerning accidents and malfunctions, it is noted that traffic accidents and related fire and fuel spillage are a possibility during all phases of the project. However, the likelihood of the occurrence of these events is considered to be low and comparable to that expected for any similarly sized municipal infrastructure renewal or construction project. Since the development of the Havelock area pre-dates modern on-site sewage disposal regulations, most of the existing on-site systems do not meet current requirements and many cannot be readily upgraded due to a number of constraints (e.g. small lot sizes, etc.). The completion of a modern communal wastewater collection and treatment system will allow for the abandonment of the existing sub-standard treatment systems and therefore result in significant net positive socio-economic benefits such as improved public health and environmental protection. Regarding the regional economy, the municipal sewage collection and treatment infrastructure will encourage growth and it is envisioned that this will result in more varied and increased future land development in the long term.

A summary of the interpreted project related environmental interaction with key valued environmental components (VECs) for the construction and operation phases of the project in addition to potential accidents, malfunctions and unplanned events is provided in Table 2 which follows **Section 10.0** of this report. A qualitative rating system was employed as outlined below to assist with the assessment which was based on the professional judgment and experience of the project team in addition to our current understanding of the project:

0= No interaction with this VEC is anticipated;
1= Interaction occurs, but it would not be expected to result in a significant environmental effect even without mitigation; or the interaction would not be expected to result in a significant environmental effect upon the implementation of suitable mitigation measures (e.g. typical environmental "best practices", project specific mitigation, etc.); and,
2= Interaction occurs and may result in an environmental effect of concern even with mitigation (this would typically require compensation for habitat loss, etc.).

Mitigation measures will be required for some potential impact categories (e.g. sedimentation and erosion control) and general comments pertaining to existing mitigating factors or proposed mitigation measures for each VEC are provided in Table 3 which follows **Section 10.0** of this report.

5 Summary of Proposed Mitigation

A summary of the proposed mitigation efforts associated with the undertaking are outlined herein. A tiered approach was utilized in developing the project mitigation measures as suggested in the technical guide to EIA in New Brunswick. Under this approach, environmental impact avoidance opportunities are implemented wherever possible. If it is not possible or practical to avoid some degree of environmental impact, impact reduction measures are stipulated. Finally, in occasional instances where more extensive impacts are unavoidable and justifiable (e.g. public good, etc.), compensation measures are proposed.

The main aspects of the work that may require mitigation include erosion control (re: suspended solids runoff); potential spills (e.g. fuel or oil from equipment); odour control; possible heritage resource encounters; control of noise; fugitive dust emissions and air quality; traffic management and impacts on adjoining property; and construction of the WWTP and sewer outfall along Ridge Brook. These will be mitigated as follows:

Suspended Solids – mitigative measures will include standard erosion control measures (e.g. silt fences, check dams) which will be employed as required during the construction phase of the project.

Spills – spills (if any) will be addressed by applicable regulatory requirements (e.g. notification and response). On-site construction equipment will be required to be in good condition and free of any known fluid leaks.

Odour Control - waste sludge handling and disposal impacts will be mitigated by adhering to a regular disposal schedule and utilizing septage hauling companies to collect the waste sludge and transport it to an approved Provincial septage receiving station.

Heritage Resource Encounters – in the event that any item of cultural or archaeological significance is encountered during construction, work in the affected area will immediately be halted and the Provincial Archaeological office will be notified.

Noise and Vibration – in general, the construction work is not expected to result in a significant increase in noise or vibration levels above ambient background levels. However, since the requirement for some rock excavation for sewer main installation is anticipated based on current (i.e. preliminary design) information and the bedrock in the area is relatively competent, it is expected that some use of an excavator equipped with a pneumatic hammer may be required. It is also possible but less likely that blasting may be required in the isolated areas where deeper excavation is required. Noise and vibration mitigation measures will include restricting any required rock hammering and/or blasting to timeframes which will reduce any nuisance impact to areas residents (e.g. normal working hours, etc.). In addition, it is expected that the judicious use of pressure sewers which can generally follow the existing topography will minimize the amount of rock excavation and the related potential for increased noise and/or vibration levels. Finally, it is noted that construction equipment will be turned off when not in use, as practical.

Noise levels associated with the treatment plant will be negligible since the engineered wetland technology requires minimal mechanical components to operate and, hence, noise mitigation measures will not be required.

Fugitive Dust Emissions and Air Quality – for aspects of the work that may lead to an increase in fugitive dust emissions above ambient conditions, standard dust suppression techniques such as water application to work area/ roadways will be used, and/or dust emission generation activities will

be ceased until weather conditions warrant. Regarding air quality, it is noted that an anti-idling policy will be implemented for construction equipment as practical.

Traffic Management and Potential Impacts on Adjoining Property – traffic control measures during construction will conform to the requirements of NBDTI's Work Area Traffic Control Manual, where applicable. It is anticipated that at least one lane of traffic will generally remain open on the local roadways affected by the installation of sewer mains. Access will be maintained to adjoining properties to the greatest practical extent and to an extent similar to typical water and sewer infrastructure renewal projects. Consequently, no major issues related to property access are anticipated.

Wetlands and Watercourses – the project involves the construction of a sewer outfall and engineered wetland along Ridge Brook. A permit will therefore be required under the provincial *Watercourse and Wetland Alteration Regulation* and the conditional terms of the permit will be respected. It is expected that a WAWA permit will not be required for the sewer main crossings of Keith Brook and an unnamed tributary along NB Route 880, since it is currently planned to employ directional drilling to complete this work.

In addition to the above, a by-law or standards will need to be developed which establish the requirements for discharging to the sanitary sewer system. These standards will ban the discharge of oil, grease, petroleum products or other chemicals which may potentially disrupt the biological treatment process in the engineered wetland and/or adversely impact the environment. The standards will also establish discharge limits for selected wastewater discharge parameters (e.g. BOD_5, etc.). **Exp** will provide sample sewer discharge by-laws or standards to the project proponent in addition to technical support related to the development of the appropriate discharge limits and list of banned substances.

Other - regarding power outages, it is noted that since the study area is serviced by wells that also require pumps and power to operate, wastewater flows would be negligible during a power outage. Notwithstanding this fact, it is noted that each pumping chamber in the pressure sewer zone has in-built storage that will allow for the restricted use of wastewater generating facilities during a power outage. In the worst case scenario where the power goes off just as the "pump on" level was reached in the wet well, enough storage will be provided for approximately two days of modified water use behavior. Similarly, emergency effluent storage capacity will be provided in the two lift stations/wet wells at the end of Maple and Garland Streets in the event of a power outage.

Effluent and other treatment system monitoring will be completed in accordance with the requirements outlined in the Approval to Operate issued by NBDELG.

The above discussion of proposed mitigation measures for the key environmental aspects of the project are intended to provide a general overview. More detailed mitigation measures will be outlined in an Environmental Management Plan (EMP) which will be developed for the project.

6 Public Involvement

The minimum public consultation requirements outlined in Appendix C of the provincial EIA registration guide will be followed. Stakeholders include the residents of the Havelock LSD within the proposed sanitary sewer servicing area. It is noted that there are no First Nation communities located in the study area. A public notice containing the information specified in the registration guide will be delivered to stakeholders subsequent to registering the undertaking.

In addition to the minimum public consultation requirements, a public open house on the project will be held to allow the public to become familiar with the project, pose questions related to the project and to raise any environmental concerns. As well, an update on the anticipated sewage user fees will be provided at the meeting. Details concerning the timing and location of the open house and the locations to obtain project related information will be advertised in one local and one provincial newspaper in accordance with the requirements outlined in the EIA registration guide.

7 Approval of the Undertaking

The following permits and approvals will be required for the proposed development:

- Authorization/conditional approval of the undertaking under the Provincial EIA requirements as outlined in NB Regulation 87-83.
- Provincial Watercourse and Wetland Alteration (WAWA) Permit from NBDELG under the Watercourse and Wetland Alteration Regulations (i.e. NB Regulation 90-80).
- Approvals to construct and operate the wastewater collection and treatment system will be required from NBDELG under the Provincial Water Quality Regulation, *Clean Environment Act.*
- Any necessary building permits for the construction of the small storage shed/maintenance building on the treatment plant site will be obtained from the Regional Service Commission (RSC) #8 planning authority.
- Approvals related to the installation of the sewer mains within the road right-of-way will be obtained from NB Department of Transportation and Infrastructure. It is anticipated that a Highway Usage Permit will be required.

8 Funding

Funding for the project is being provided through the federal Gas Tax Fund and the Province of New Brunswick.

9 Signature

This EIA registration document was prepared by a team of **exp** Services Inc. professionals on behalf of NBDELG.

Dec 22, 2014
Date

Gordon P. Wasson, P. Eng.
exp Services Inc.

10 References

ADI Limited, 2005. Water and Sewer Study – Community of Havelock. Report to the Havelock Local Service District dated May, 2005. ADI project number (80) 5604-001.1.

Environment Canada, 2006. Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal.

New Brunswick Department of the Environment (NBDENV), 2003. Guidelines for the Management of Contaminated Sites – Version 2.0. November, 2003.

Potter, R. R., E. V. Jackson and J. L. Davies, 1968. Geological Map of New Brunswick, Map Number N.R.-1.

Rampton, V. N., R. C. Gauthier, J. Thibault and A. A. Seaman, 1984. Quaternary Geology of New Brunswick, Geological Survey of Canada, Memoir 416.

Table 2: Project-Environment Interaction Matrix

Component	Air Quality	Sound Quality	Groundwater	Surface Water	Fish and Fish Habitat	Wildlife/Habitat	Species at Risk	Wetlands	Heritage/ Archaeology	Land Use	Land Use by First Nations	Human Health	Transportation and Navigation
Construction Activities													
Clearing & Grubbing	1	1	0	1	1	1	0	0	1	0	0	0	0
Installation of Gravity & Pressure Sewers and Related Infrastructure	1	1	1	1	1	0	0	0	1	0	0	0	1
Treatment Plant & Related Infrastructure	1	1	0	1	1	1	0	0	1	0	0	0	0
Operation and Maintenance													
Treatment Plant	0	0	0	1	1	0	0	0	0	0	0	0	0
Sewer lines & Related Infrastructure	0	0	1	1	1	0	0	0	1	0	0	0	1
Potential Accidents/Malfunctions													
Hazardous Material Spills	0	0	1	1	1	0	0	0	0	1	0	1	1
Erosion & Sediment Control Failure	0	0	0	1	1	0	0	0	0	0	0	0	0
Fires	1	0	0	0	0	0	0	0	0	1		1	1
Vehicular Collisions	0	0	1	1	1	0	0	0	0	0	0	1	1
Fish or Wildlife Encounter	0	0	0	0	1	1	0	0	0	0	0	0	0
Disturbance of Archaeological Resources	0	0	0	0	0	0	0	0	1	0	0	0	0

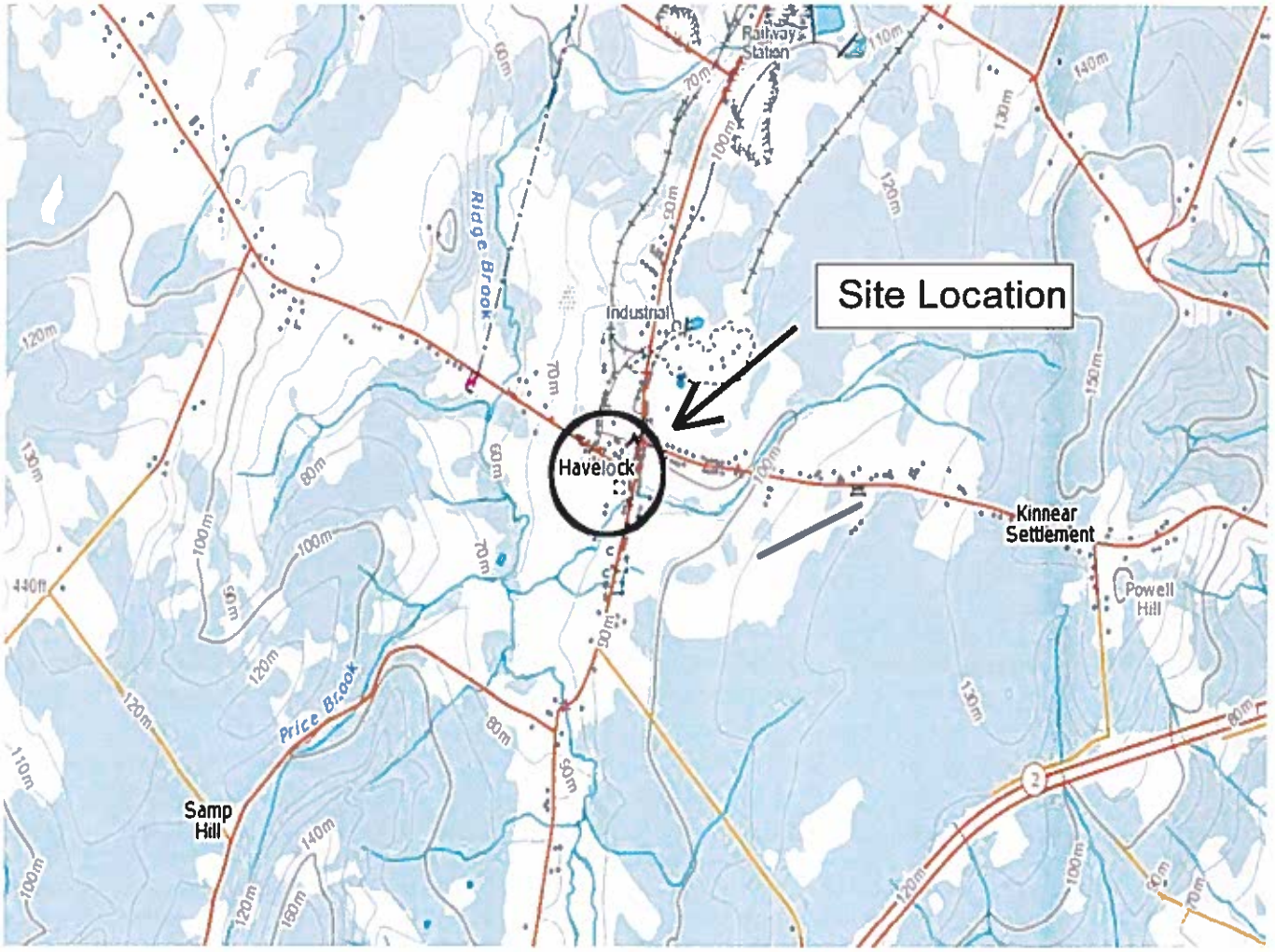
Table 3 Environmental Effects Checklist

Environmental Component	Potential Project Effects						Comments/Mitigation Measures
	Potential Adverse Effect?			Mitigation Required?			
	Yes	*No*	*Uncertain*	*Yes*	*No*	*Uncertain*	*Uncertain*
1) Topography		x					- No significant change in topography will occur.
2) Species/Habitat of Special Status		x					- Other than the wastewater treatment plant; the installation of sewer inlet piping which will follow a municipal services easement; and the possible requirement to construct a new access road to the treatment plant, the project will be limited to construction in previously disturbed areas such as existing roadways and developed residential or commercial lots. Some localized clearing and grubbing will be required for the construction of the wastewater treatment related infrastructure. - Some butternut trees which are an endangered species under the provincial *Endangered Species Act* were identified within 5 km of the central portion of the community in an ACCDC database search. However, it is noted that no butternut trees are known to be located in any of the proposed construction areas, and it is expected that the majority of the trees in the area are located in the Havelock Ridge ESA which is situated about 2.4 km north of the community and away from the proposed construction areas.
3) Vegetation	x			x			
4) Wildlife / Habitat		x					
5) Fish and Fish Habitat	x			x			- Work will be subject to and completed in accordance to NBELG Watercourse and Wetlands Alteration Regulation permits and requirements. - Sedimentation and erosion control measures will be in place. - Directional drilling will be utilized to install sewer lines which will cross the two Ridge Brook tributaries which traverse NB Route 880.
6) Marine Resources		x					- There are no marine areas or resources in the project vicinity.
7) Soils		x					- No impacts to area soils are anticipated.
8) DrinkingWater		x					- The study area is serviced by private water supply wells and is outside any wellfield protection areas. - Mitigation measures (e.g. refueling in designated areas at least 30 m from a watercourse) for the control of petroleum, oil and lubricants on the construction site will be included in the project Environmental Management Plan. - Based on the above, no significant impacts to groundwater are anticipated.
9) Groundwater		x					
10) Surface Water / Hydrology	x			x			- Refer to response to Item 5) outlined above.
11) Wetlands		x					- No impacts are anticipated since there are no known wetlands within the area of proposed work.
12) Sediments		x					- Sedimentation and erosion control measures will be in place.
13) Climate and Air Quality	x			x			- There will be some minor project related greenhouse gas emissions due to operation of construction equipment. These are

							expected to have no significant impact on climate, and will be temporary. An anti-idling policy will be implemented for construction equipment, as practical. - There will be potential for temporary, local scale impact on air quality related to construction activities. Impacts are anticipated to be associated with vehicle and fugitive dust emissions related to use of construction equipment. Mitigation measures will be outlined in the project specific EPP developed to govern the construction phase of the project. Typical measures will include dust suppression techniques (e.g. water application on problem areas), and limiting/ ceasing activities in potential problem areas on windy days.
14) Noise	x			x			- There will be potential for temporary increase in noise related to use of construction equipment and the possible requirement for some limited rock hammering/blasting (see below). Mitigation measures will be outlined in the project specific EPP developed to govern the construction phase of the project. Measures will include turning off construction equipment when not in use and limiting the hours of construction activity.
15) Vibration	x			x			- There will be potential for temporary, localized impacts related to vibration associated with construction equipment used during the construction phase. However, it is expected that all excavation work can be completed using standard construction techniques and equipment (e.g. back hoes). Some limited blasting may be required to assist with rock removal to allow for the installation of sewer mains in some areas. However, it is expected that most of the bedrock will be excavated with an excavator equipped with a standard bucket or pneaumatic hammer. The use of pressure sewers which can be placed at relatively shallow depth and follow the contours of the land will also limit the potential requirement for blasting and pneaumatic hammering. Mitigation measures will be outlined in the project specific EPP developed to govern the construction phase of the project. Measures will include limiting the hours of construction activity.
16) Transportation and Navigation	x			x			- It is expected that a minimum of one lane of traffic will be maintained on roadways affected by construction during the majority of the construction work. The contractor will also be required to adhere to the traffic control requirements outlined in NBDTI's Work Area Traffic Control Manual.
17) Land Use	x			x			- Refer to responses to Item 2), Item 3) and Item 4) outlined above.
18) Human Health		x					- Human health protection objectives will be enhanced as the project will result in the elimination of the many on-site sewage disposal systems in the community which were constructed prior to or otherwise do not comply with current regulatory requirements.
19) Socio-economic Conditions[1]		x					- Socio-economic conditions will be improved as the project will result in improved wastewater treatment. Furthermore, the construction of a communal wastewater collection and treatment system is expected to promote future economic development in the

							area in the long term.
20) Physical/Cultural Heritage	x			x			- No impacts anticipated. However, there is potential that an archaeological artifact could be encountered during construction excavation activities. Mitigation measures will be outlined in the project specific EPP developed to govern the construction phase of the project, and include cessation of all work and notification of the Provincial Archaeological office in the event an object or area of potential archaeological significance is encountered during excavation work.
21) Aboriginal Use of Traditional Lands/Resources		x					- No impact.
22) Structures/Sites of Significance		x					- There are no structures/ sites of significance within the project footprint; also, refer to item 20), above.
23) Other		x					- None

Accidents and Malfunctions	x			x			- There is potential for accidents and malfunctions during the construction and operation phases of the project. Representative incidents include vehicle accidents, and spillage of fuels. Mitigation measures to address potential incidents will be outlined in the project specific EPP that will address environmental aspects related to construction and operations activities. Representative mitigation measures include the requirement to maintain construction equipment to prevent spills, obey traffic regulations and use designated fuelling areas outside a minimum 30 m buffer from watercourses.
Effects of Environment on the Project			x				- No significant impacts are anticipated.



FOR INFORMATION ONLY

SCALE
0 1 KM

N

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA
www.exp.com

The new identity of AGI Limited
BUILDINGS • EARTH & ENVIRONMENT • ENERGY • INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

Project Title
EIA REGISTRATION – HAVELOCK WASTEWATER COLLECTION & TREATMENT SYSTEM

Dwg. Title
SITE LOCATION PLAN

Drawn By: AMP	Project No. MON-00021215-A0
Dwg. Standards Ckd. By:	Dwg. No. FIGURE 1
Designed By:	Dwg. Design Ckd. By: / Rev. No.

No.	Revision	Ckd. By	Date

Const. North

Drawn By: AMP

Dwg. Standards Ckd. By:

Designed By:

Date Printed

Dwg. Design Ckd. By:

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA
www.exp.com

BUILDINGS · EARTH & ENVIRONMENT · ENERGY · INDUSTRIAL · INFRASTRUCTURE · SUSTAINABILITY

Project Title

EIA Registration – Havelock Wastewater Collection & Treatment System

Dwg. Title

Aerial Site Plan

Project No.: MON-00021215-A0

Dwg. No.: Figure 2

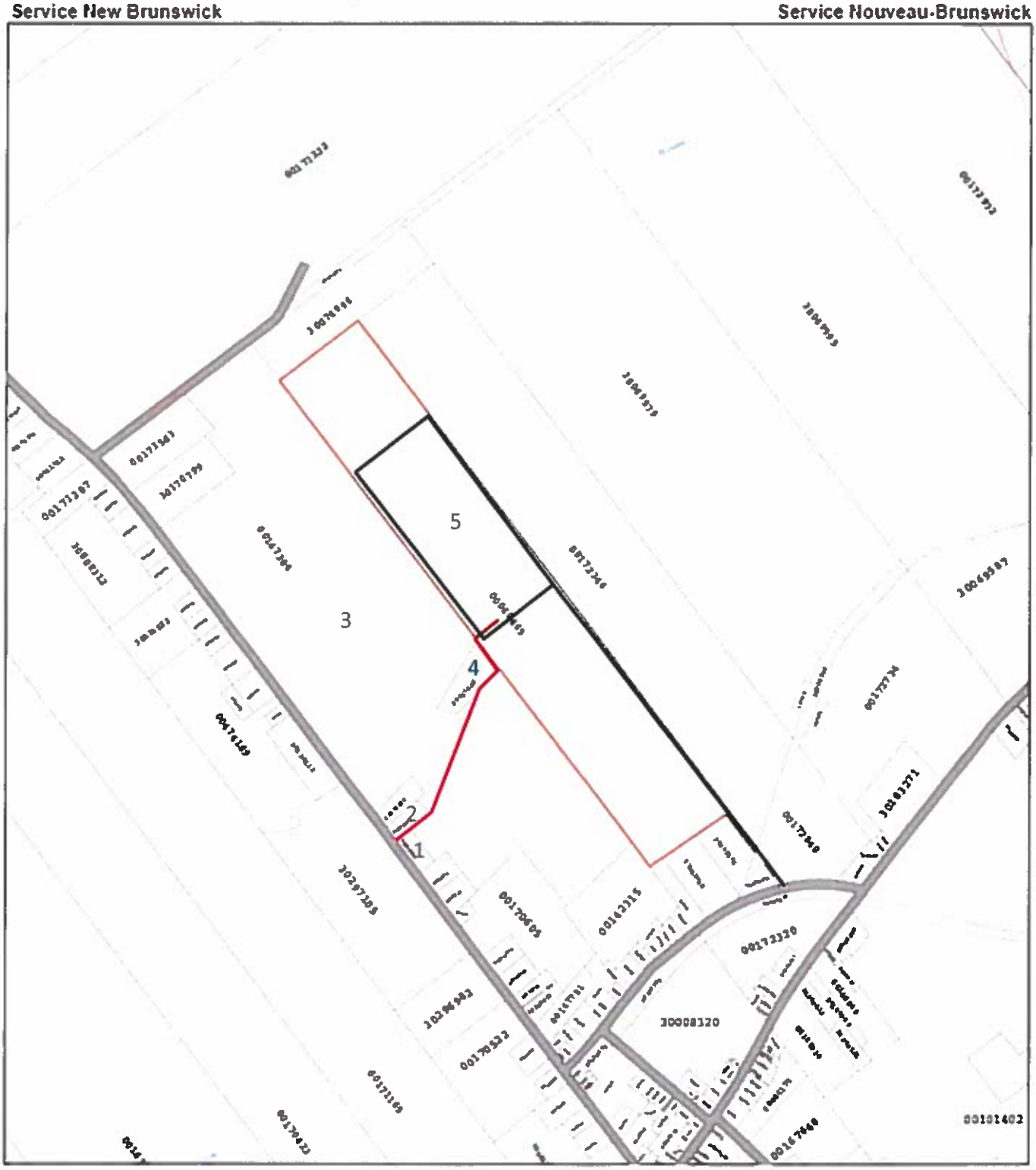
Rev. No.:

Scale: As noted on drawing

This drawing is not to be scaled

Service New Brunswick

Service Nouveau-Brunswick



Access road

Proposed easement option 1

1 Abutting properties

map scale 1:11 484

N

FOR INFORMATION ONLY

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA
www.exp.com

exp.

The new identity of ADI Limited

BUILDINGS • EARTH & ENVIRONMENT • ENERGY • INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

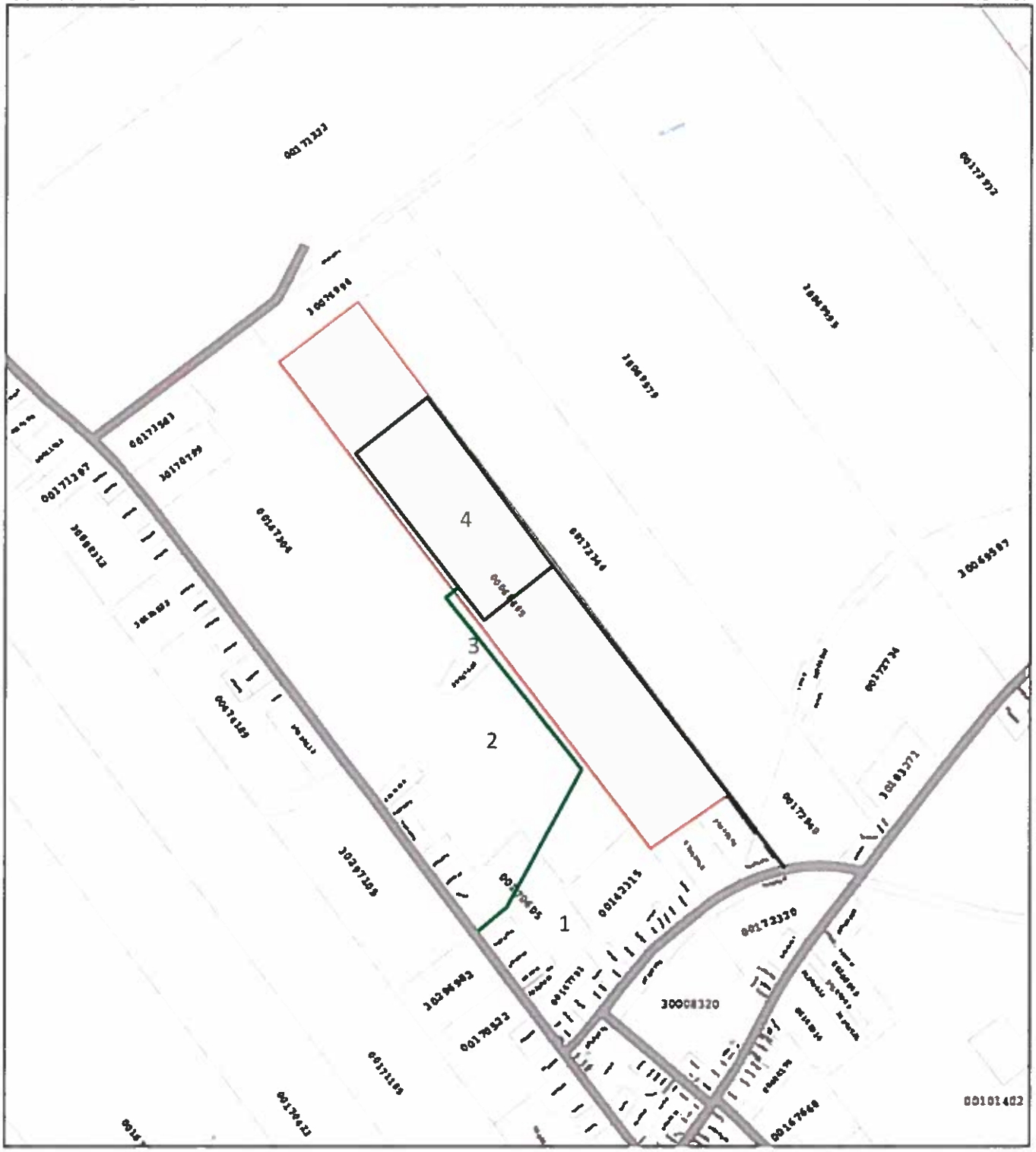
Project Title: EIA REGISTRATION
HAVELOCK COMMUNAL WASTEWATER COLLECTION AND TREAMENT SYSTEM

Dwg Title: PROPERTY OWNERSHIP LAYOUT OPTION 1

Drawn By: AMP	Project No. MON-0021215-A0	
Dwg. Standards Ckd. By:	Dwg. No. FIGURE 3A	
Designed By:	Dwg. Design Ckd. By:	Rev. No.

Service New Brunswick

Service Nouveau-Brunswick



Access road

Proposed easement option 2

1 Abutting properties

map scale 1:11 484

N

FOR INFORMATION ONLY

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA
www.exp.com

exp.

The new identity of AGI Limited

BUILDINGS • EARTH & ENVIRONMENT • ENERGY • INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

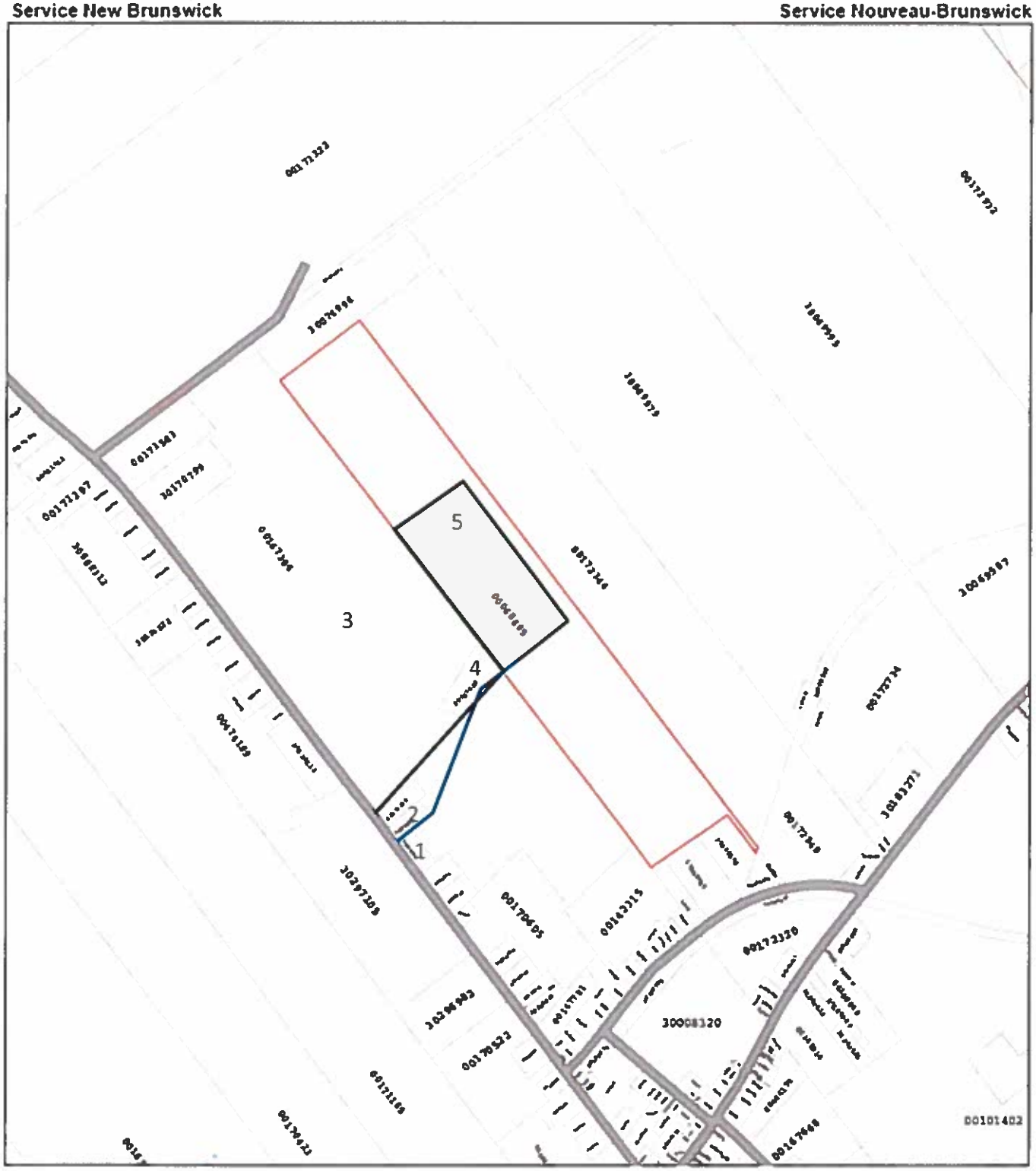
Project Title: EIA REGISTRATION
HAVELOCK COMMUNAL WASTEWATER COLLECTION AND TREAMENT SYSTEM

Dwg. Title: PROPERTY OWNERSHIP LAYOUT OPTION 2

Drawn By: AMP	Project No. MON-0021215-A0	
Dwg. Standards Ckd. By:	Dwg. No. FIGURE 3B	
Designed By:	Dwg. Design Ckd. By:	Rev. No.

Service New Brunswick

Service Nouveau-Brunswick



Access road

Proposed easement option 3

1 Abutting properties

map scale 1:11 484

FOR INFORMATION ONLY

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA
www.exp.com

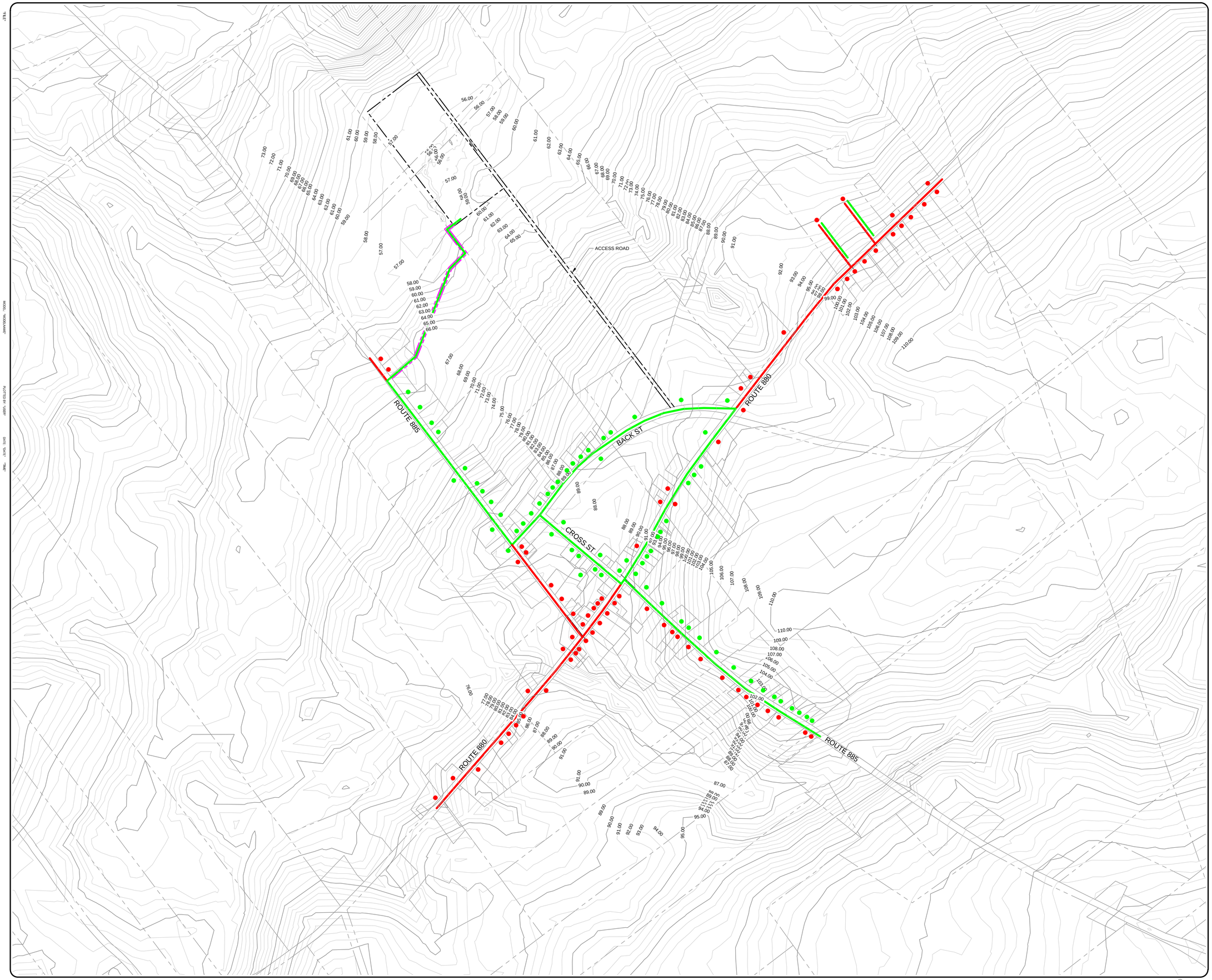
exp.

The new identity of AGI Limited

BUILDINGS • EARTH & ENVIRONMENT • ENERGY • INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

Project Title: EIA REGISTRATION HAVELOCK COMMUNAL WASTEWATER COLLECTION AND TREAMENT SYSTEM	
Dwg. Title: PROPERTY OWNERSHIP LAYOUT OPTION 3	
Drawn By: AMP	Project No. MON-0021215-A0
Dwg. Standards Ckd. By:	Dwg. No. FIGURE 3C
Designed By:	Dwg. Design Ckd. By: / Rev. No.

Appendix A –
Preliminary Project Design Drawings



No.	Issue	Date

LEGEND

- PROPOSED EASEMENT - OPTION 1
- PROPOSED EASEMENT - OPTION 2
- GRAVITY SANITARY SEWER
- FORCEMAIN SANITARY SEWER
- GRAVITY SANITARY LATERALS
- FORCEMAIN SANITARY LATERALS

No.	Revision	Ckd. By	Date

PRELIMINARY

Const. North

Drawn By: JRDA

Dwg. Standards Ckd. By:

Designed By: AMM

Date Printed

Dwg. Design Ckd. By:

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA

www.exp.com

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

Project Title

HAVELOCK
WASTEWATER COLLECTION
AND TREATMENT SYSTEM

Dwg. Title

OVERALL CONCEPTUAL LAYOUT OPTION 1

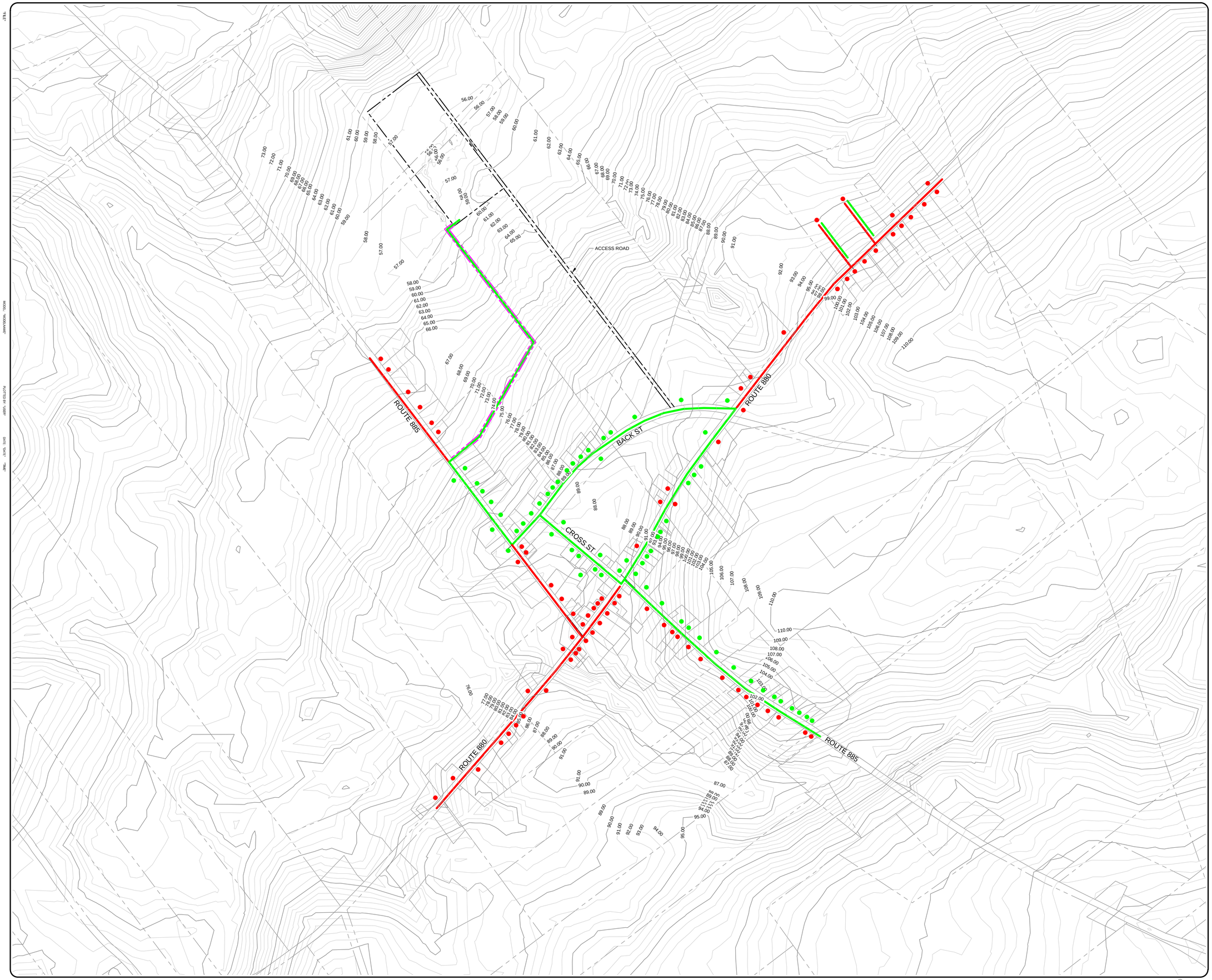
Project No. MON-00021215-A0

Dwg. No. **9-2**

Rev. No. 0

Scale

1:5000 HORIZ., 1:50 VERT.
This drawing is not to be scaled



No.	Issue	Date

LEGEND

- PROPOSED EASEMENT - OPTION 1
- PROPOSED EASEMENT - OPTION 2
- GRAVITY SANITARY SEWER
- FORCEMAIN SANITARY SEWER
- GRAVITY SANITARY LATERALS
- FORCEMAIN SANITARY LATERALS

No.	Revision	Ckd. By	Date

PRELIMINARY

Const. North

Drawn By: JRDA

Dwg. Standards Ckd. By:

Designed By: AMM

Date Printed

Dwg. Design Ckd. By:

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA

www.exp.com

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

Project Title

HAVELOCK
WASTEWATER COLLECTION
AND TREATMENT SYSTEM

Dwg. Title

OVERALL CONCEPTUAL LAYOUT OPTION 2

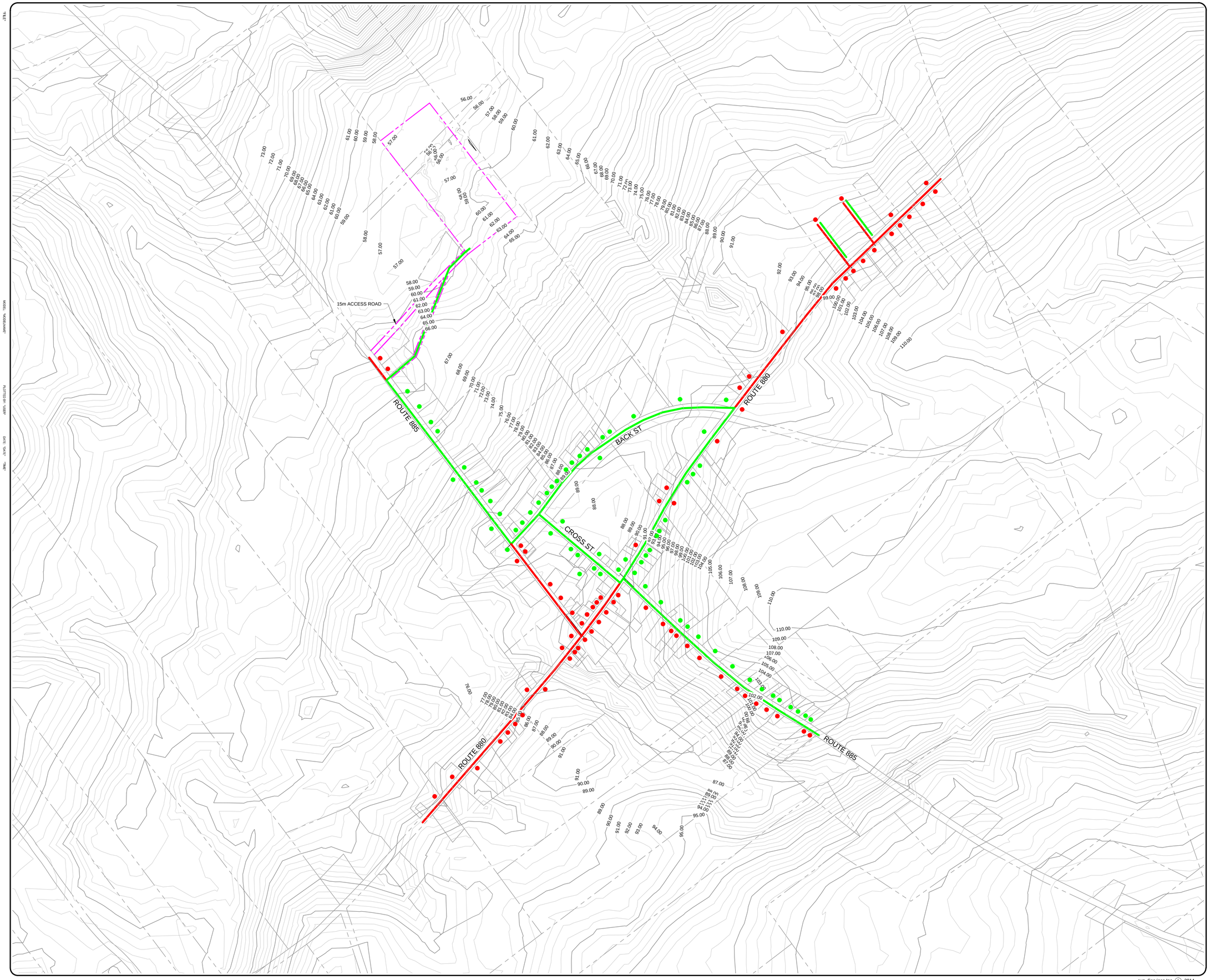
Project No. MON-00021215-A0

Dwg. No. **9-3**

Rev. No. 0

Scale

1:5000 HORIZ., 1:50 VERT.
This drawing is not to be scaled



No.	Issue	Date

LEGEND

- PROPOSED EASEMENT - OPTION 1
- PROPOSED EASEMENT - OPTION 2
- GRAVITY SANITARY SEWER
- FORCEMAIN SANITARY SEWER
- GRAVITY SANITARY LATERALS
- FORCEMAIN SANITARY LATERALS

No.	Revision	Ckd. By	Date

PRELIMINARY

Const. North

Drawn By: JRDA

Dwg. Standards Ckd. By:

Designed By: AMM

Date Printed

Dwg. Design Ckd. By:

exp Services Inc.
t: +1.506.857.8889 | f: +1.506.857.8315
40 Henri Dunant Street,
Moncton, NB E1E 1E5
CANADA

www.exp.com

• BUILDINGS • EARTH & ENVIRONMENT • ENERGY •
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

Project Title

HAVELOCK
WASTEWATER COLLECTION
AND TREATMENT SYSTEM

Dwg. Title

OVERALL CONCEPTUAL LAYOUT OPTION 3

Project No. MON-00021215-A0

Dwg. No. **9-4**

Rev. No. 0

Scale

1:5000 HORIZ., 1:50 VERT.
This drawing is not to be scaled

Appendix B –
Abydoz Engineered Wetland Literature

Treating Wastewater Naturally…


Small Scale System


Municipal Sludge Cells


Steel Mill Effluent


Municipal Sewage

Engineered Wetlands for:

Municipal Sewage
Municipal Sludge
Landfill Leachate
Industrial Wastes
Airport Glycol
and more…

Stephenville System
Population 8,000 PE
Average Flow 4,555 m³/day
5 Acres, 20,000 m², < 3 m²/PE

ABYDÖZ

Abydoz Environmental Inc.

First Year Average Tested Data – Appleton/Glenwood Engineered Wetland Project Treating 1800 PE with Average Flow 3400 m³/day						
Parameter	Inlet	Wetland		Down River		Standard
		Outlet	Reduction	Outlet	Reduction	
BOD (mg/l)	106.0	7.2	93.2%	3.0	97.2%	20 mg/l
TSS (mg/l)	1622.0	5.9	99.6%	2.0	99.9%	30 mg/l
Nitrogen (ammonia) (mg/l)	17.3	5.9	65.9%	0.5	97.1%	2.0 mg/l
Total Phosphorous (mg/l)	2.2	0.4	81.8%	0.01	99.6%	1.0 mg/l
Total Coliform (MPN/100 ml)	1,450,000	11,500	99.2%	770	99.9%	5,000
Fecal Coliform (MPN/100 ml)	1,160,000	1,300	99.9%	260	100%	1,000

System Advantages

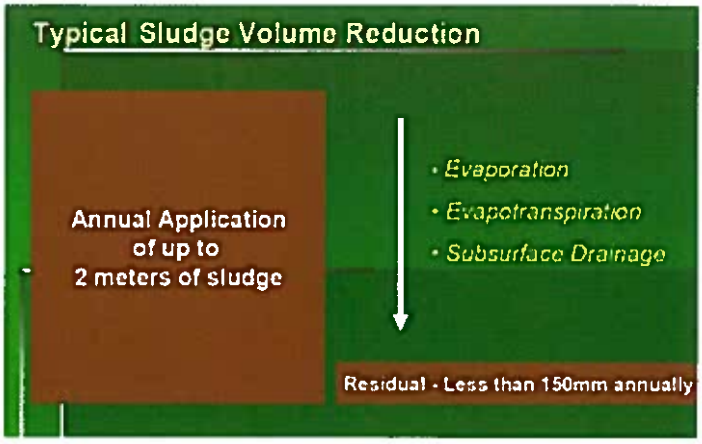
- Very high treatment levels – will meet new Federal regulatory requirements
- Easily added to existing systems to create higher treatment results
- No electricity, no chemicals
- Long system life (60+ years)
- Very low operating costs
- Treat liquid sewage and solid sludge
- Storm water treatment – no bypass

Root Zone Treatment - How it Works

Treatment occurs below the surface of the wetland, in a region of soil and gravel that is referred to as the matrix. Specialized reed plants transfer air to their root mass thereby allowing aerobic bacteria to thrive in the matrix. The matrix is specifically designed to host thousands of different types of bacteria.

The bacteria consume the sewage as it flows through the wetland, treating it, to produce a naturally clean effluent, see 12 month average results above.

Each system is individually engineered to meet its own specific treatment requirements, and outfall conditions.



Both the solid and liquid portions of municipal sewage waste are treated in the wetland system.

In the sludge treatment cells the reed plants dewater and mineralize the sludge through the natural processes of water consumption, evapotranspiration, and microbial treatment. This converts the biosolids from septic tanks, clarifiers and lagoons into an inert compost-like material that can be recycled for landscaping purposes.

Abydoz Environmental Inc.
(709) 895-2120 • info@abydoz.com
www.abydoz.com

ABYDOZ

Treating Wastewater Naturally...

The Appleton-Glenwood Engineered Wetland

Location: Town of Glenwood, Newfoundland and Labrador

Type: Municipal Sewage and Sludge Treatment

Population Served: 1,800 P.E. (Population Equivalent)

Average Flow: 3,037 m^3/d

Wetland Treatment Area: 12,000 m^2
- 4 horizontal-flow subsurface wetland beds
- 1 vertical-flow subsurface wetland bed
- 1 storm water treatment bed – no bypass
- 3 Sludge treatment cells

Constructed in: June – November 2006

Commissioned in: December 2006 – June 2007

Awards:
• 2010 Environment Award, Professional Engineers and Geoscientists of Newfoundland and Labrador (PEG-NL)
• 2008 Provincial Environmental Award – Town of Appleton

Description: The Towns of Appleton and Glenwood had overloaded, outdated sewage treatment systems. The engineered wetland system was chosen for its low operating costs, high treatment capabilities, environmental benefits, and ability to treat sludge.

The effluent from both towns is pumped to the treatment facility where it passes through a grinder and a spiral lift screen to remove non-organic materials. The flow then enters a series of settling chambers where solids and suspended solid settle out.

During times of high infiltration, the flow is split by a weir that sends the main flow to the wetland treatment beds and any excess to a storm water treatment bed. There is no bypass on this system. All effluent including storm water is treated. The wetlands reduce the contaminants by biological treatment. The two flows are recombined at the end of the system and discharged to the Gander River.

Other than the screen and grinder there are no mechanical or electrical components. No electricity or chemicals are required in the wetland.

Sludge from the settling chambers is pumped to the sludge treatment wetland cells where it is mineralized by the plants resulting in a compost-like end product that can be used for landscaping, or Abydoz will use it at its nurseries.

Aerial view

Plant growth in system

Sludge treatment cells

Educational tour for school group

Abydoz Environmental Inc.
(709) 895-2120 • info@abydoz.com
www.abydoz.com

ABYDÖZ

Treating Wastewater Naturally...

The Town of Stephenville Engineered Wetland

Location: Town of Stephenville, Newfoundland and Labrador

Type: Municipal Sewage Treatment

Population Served: 7,800 P.E. (Population Equivalent)

Average Flow: 4,555 m^3/d

Wetland Treatment Area: 20,000 m^2
- 8 horizontal-flow subsurface wetland beds
- 2 vertical-flow subsurface wetland beds

Commissioned in: Fall 2009 – Spring 2010

Description: This is the largest subsurface wetland system providing secondary treatment in Atlantic Canada. It is located in the Town of Stephenville, on the west coast of the island of Newfoundland. The system is located on the Stephenville airport property. Subsurface flow ensures that the wetland does not attract water fowl or other wildlife that could impact the airport operations

Effluent from the town passes through a spiral screen to remove plastics and non-biodegradable items. Then the flow enters a primary clarifier to settle out suspended solids. From the clarifier the flow is split eight ways and proceeds through the horizontal-flow wetland beds where biological reduction takes place. The flow is then recombined and passes through two vertical beds with final discharge to the ocean.

Sludge treatment cells are located on the other side of the airport. Reed plants mineralize the sludge from the clarifier, producing a compost-like material. Onsite sludge treatment cells provide significant cost savings by eliminating expensive sludge transportation and disposal costs.

System Advantages:

• Long System life (60+ years)

• No electricity, no chemicals in engineered wetlands

• Very low operating costs, very little maintenance

•Treatment of liquid effluent and all removed solids

•Easily expandable for size or treatment with additional beds

•Exceeding treatment requirements

Aerial view of system

Planting during construction

One of eight horizontal beds

Application of sludge to sludge cell

Abydoz Environmental Inc.
(709) 895-2120 • info@abydoz.com
www.abydoz.com

Appendix C –
Results of ACCDC Database Search

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

DATA REPORT 5302: Havelock, NB

Prepared 13 November 2014
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, 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, and Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
HavelockNB_5302ob.xls	All Rare and legally protected *Flora and Fauna* within 5 km of your study area
HavelockNB_5302ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
HavelockNB_5302sa.xls	All *Significant Natural Areas* in your study area

1.2 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 to potential threats to rare and/or endangered flora and fauna posed by the information provided.
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, and to make a new request for updated data if necessary at that time.
d) ACCDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

Please direct any additional questions about ACCDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sblaney@mta.ca

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
jklymko@mta.ca

Plant Communities
Sarah Robinson , Community Ecologist
Tel: (506) 364-2664
srobinson@mta.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
jlchurchill@mta.ca

Billing
Jean Breau
Tel: (506) 364-2659
jrbreau@mta.ca

Questions on the biology of Federal Species at Risk can be directed to ACCDC: (506) 364-2657, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne
(902) 648-3536
baynedz@gov.ns.ca

Western: Donald Sam
(902) 634-7525
samdx@gov.ns.ca

Central: Shavonne Meyer
(902) 893-6353
meyersj@gov.ns.ca

Central: Kimberly George
(902) 893-5630
georgeka@gov.ns.ca

Eastern: Mark Pulsifer
(902) 863-7523
pulsifmd@gov.ns.ca

Eastern: Donald Anderson
(902) 295-3949
andersdg@gov.ns.ca

Eastern: Terry Power
(902) 563-3370
powertd@gov.ns.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Rosemary Curley, PEI Dept. of Agriculture and Forestry: (902) 368-4807.

2.0 RARE AND ENDANGERED SPECIES

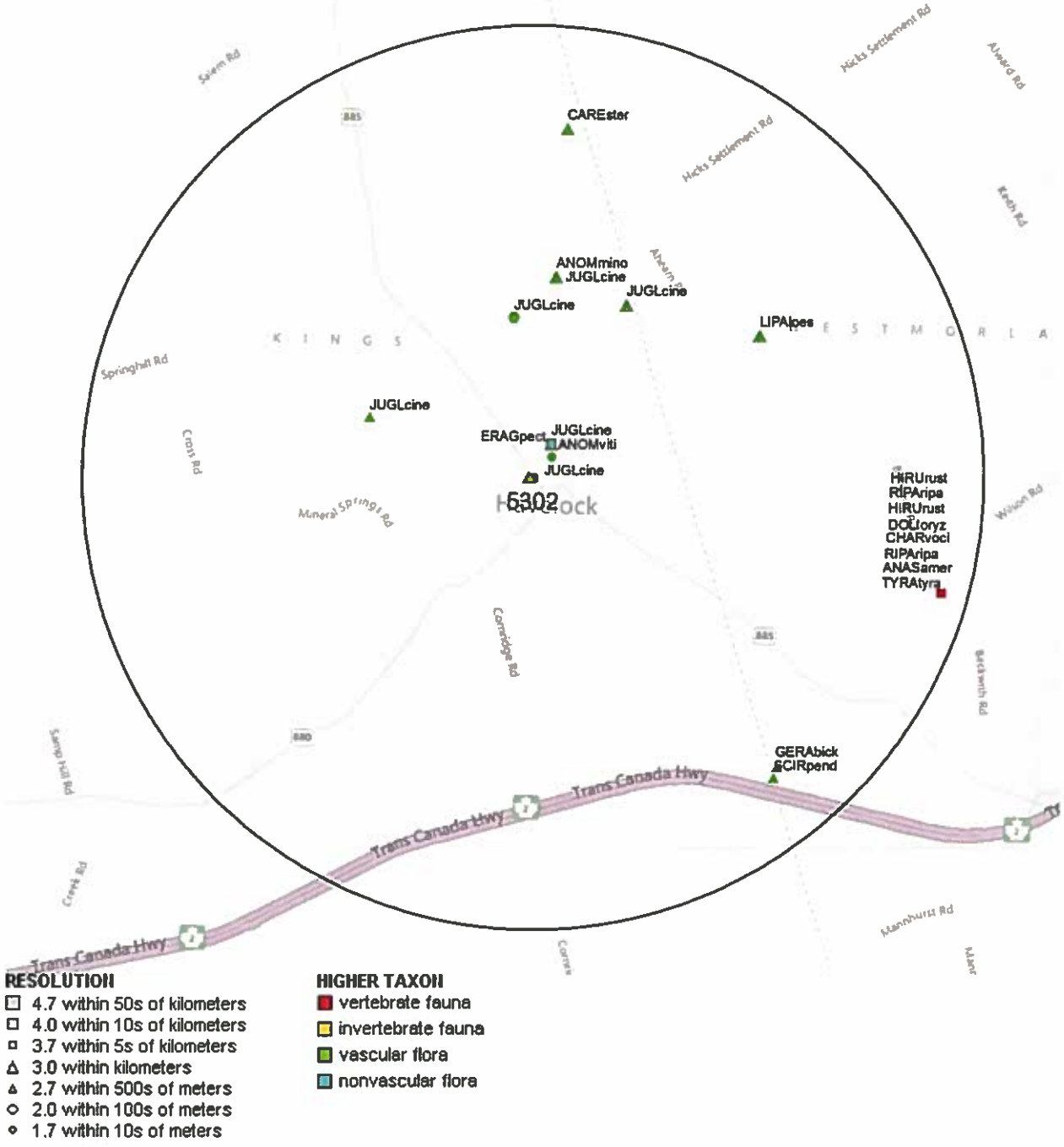
2.1 FLORA

A 5 km buffer around the study area contains 15 records of 6 vascular, 2 records of 2 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 11 records of 6 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within 5 km of the study area.



3.0 SPECIAL AREAS

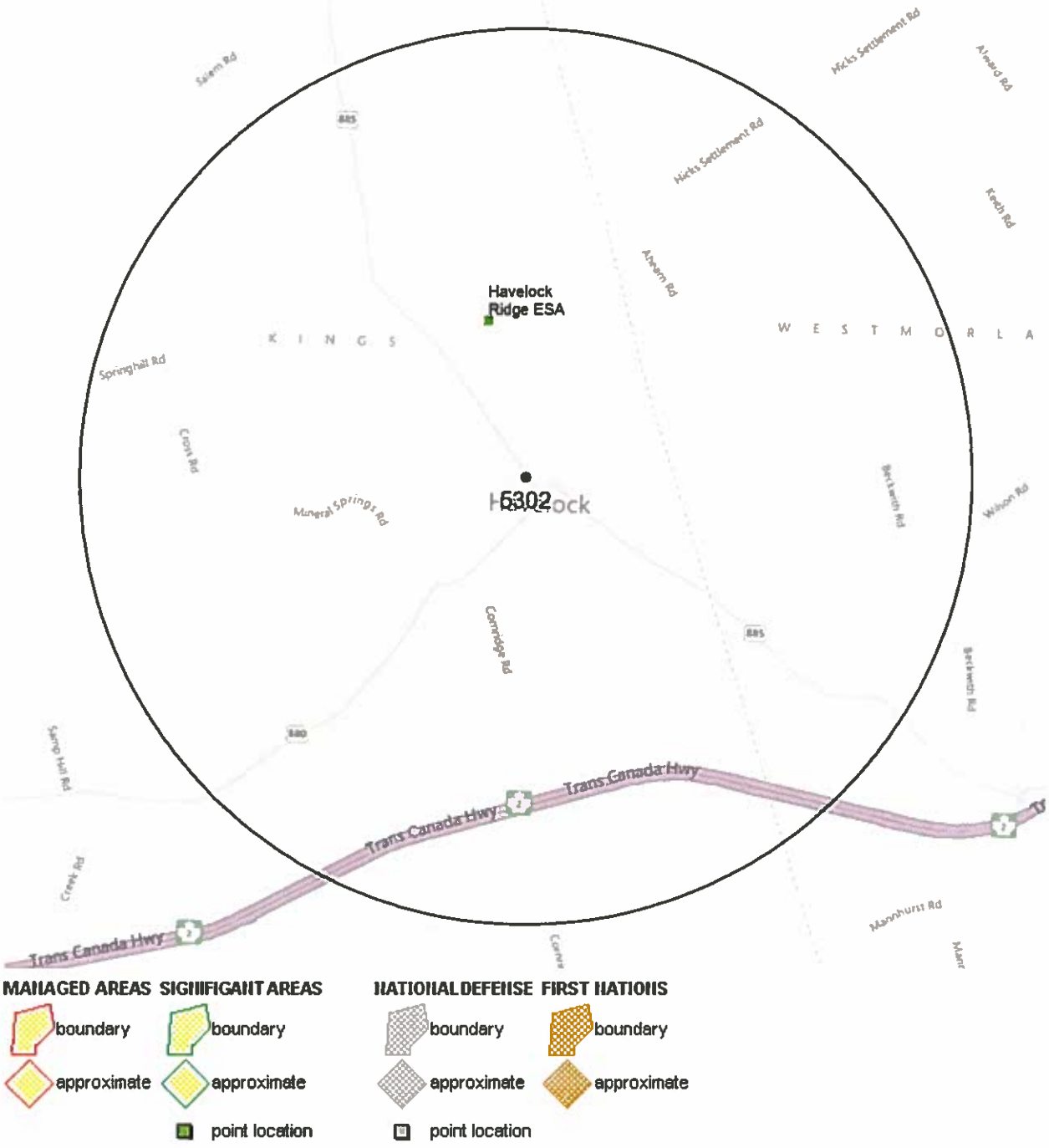
3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3 and attached file: *ma*.xls)

3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *sa*.xls)

Map 3: Boundaries and/or locations of known Managed and Significant Areas within 5 km of the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa within the 5 km-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	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Anomodon minor*	Blunt-leaved Anomodon Moss				S1	2 May Be At Risk	1	2.2 ± 1.0
N	*Anomodon viticulosus*	a Moss				S1	2 May Be At Risk	1	0.4 ± 10.0
P	*Juglans cinerea*	Butternut	Endangered	Endangered		S1	1 At Risk	6	0.0 ± 2.0
P	*Carex sterilis*	Sterile Sedge				S1	2 May Be At Risk	1	3.9 ± 2.0
P	*Scirpus pendulus*	Hanging Bulrush				S1	2 May Be At Risk	5	4.3 ± 0.5
P	*Eragrostis pectinacea*	Tufted Love Grass				S2?	4 Secure	1	0.3 ± 0.01
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	1	4.2 ± 0.5
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	1	3.0 ± 1.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	3 Sensitive	3	4.7 ± 7.07
A	*Hirundo rustica*	Barn Swallow	Threatened			S3B	3 Sensitive	3	4.7 ± 7.07
A	*Dolichonyx oryzivorus*	Bobolink	Threatened			S3S4B	3 Sensitive	2	4.7 ± 7.07
A	*Anas americana*	American Wigeon				S3B	4 Secure	1	4.7 ± 7.07
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	1	4.7 ± 7.07
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	1	4.7 ± 7.07

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting a 5 km buffer of your study area are indicated below with "YES".

New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within 5 km of Study Site?
Glyptemys insculpta	Wood Turtle	Threatened		No
Chelydra serpentina	Snapping Turtle	Special Concern		No
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
Chrysemys picta picta	Eastern Painted Turtle			No

4.4 SOURCE BIBLIOGRAPHY

The recipient of these 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	CITATION
9	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
5	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton, 2003.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
2	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
2	Benedict, B. Connell Herbarium Specimens (Data). University New Brunswick, Fredericton, 2003.
2	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 62,125 recs.
1	Blaney, C.S., Mazerolle, D.M., Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.

1 Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1 Goltz, J.P. 2012. Field Notes, 1989-2005., 1091 recs.
1 Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
1 Loo, J. & MacDougall, A. 1994. GAP analysis: Summary Report. Fundy Model Forest, 2 recs.
1 Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 13157 records of 152 vertebrate and 1021 records of 79 invertebrate fauna; 5001 records of 366 vascular, 360 records of 147 nonvascular flora (attached: *ob100km.xls).

Rare and/or endangered taxa within the 100 km-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.

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Myotis lucifugus*	Little Brown Myotis	Endangered		Endangered	S1	1 At Risk	55	37.9 ± 0.1
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered		Endangered	S1	1 At Risk	18	37.9 ± 0.1
A	*Perimyotis subflavus*	Eastern Pipistrelle	Endangered		Endangered	S1	1 At Risk	17	33.9 ± 1.0
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	1	94.1 ± 0.5
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	91.8 ± 1.0
A	*Morone saxatilis*	Striped Bass	Endangered			S2	2 May Be At Risk	41	23.1 ± 0.1
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	47	27.9 ± 0.1
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S2B	1 At Risk	750	53.8 ± 7.07
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S3M	1 At Risk	478	57.1 ± 0.5
A	*Rallus elegans*	King Rail	Endangered	Endangered		SNA	8 Accidental	5	44.3 ± 0.15
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gaspé-sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	34.3 ± 1.0
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered				4	66.4 ± 0.15
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	1 At Risk	17	35.6 ± 7.07
A	*Hylocichla mustelina*	Wood Thrush	Threatened		Threatened	S1S2B	2 May Be At Risk	113	9.6 ± 7.07
A	*Sturnella magna*	Eastern Meadowlark	Threatened		Threatened	S1S2B	2 May Be At Risk	45	9.6 ± 7.07
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B	1 At Risk	50	20.5 ± 7.07
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B	1 At Risk	190	19.1 ± 7.07
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2S3B	1 At Risk	4	58.2 ± 0.15
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	2	23.1 ± 1.0
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S3	1 At Risk	594	15.9 ± 1.0
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B	1 At Risk	270	8.4 ± 0.15
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B	3 Sensitive	772	4.7 ± 7.07
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	3 Sensitive	344	4.7 ± 7.07
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B	1 At Risk	427	10.6 ± 0.15
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B	1 At Risk	526	12.2 ± 7.07
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3S4B	3 Sensitive	682	4.7 ± 7.07
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S5	4 Secure	82	17.8 ± 0.1
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B	2 May Be At Risk	5	65.2 ± 7.07
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B	1 At Risk	197	43.1 ± 0.05
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	5	57.2 ± 10.0
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2N	3 Sensitive	3	65.2 ± 0.1
A	*Balaenoptera physalus*	Fin Whale - Atlantic pop.	Special Concern	Special Concern	Special Concern	S2S3		2	58.3 ± 1.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	7	60.0 ± 1.0
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S3B	3 Sensitive	43	54.4 ± 7.07

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B	2 May Be At Risk	93	14.6 ± 7.07
A	*Phocoena phocoena (NW Atlantic pop.)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		4	99.1 ± 0.5
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B	4 Secure	485	9.8 ± 7.07
A	*Tryngites subruficollis*	Buff-breasted Sandpiper	Special Concern			SNA	8 Accidental	9	47.9 ± 0.5
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	18	22.5 ± 10.0
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S1	3 Sensitive	5	46.7 ± 0.1
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	5 Undetermined	3	50.2 ± 0.1
A	*Cistothorus platensis*	Sedge Wren	Not At Risk			S1B	5 Undetermined	7	24.9 ± 7.07
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B	2 May Be At Risk	11	27.0 ± 7.07
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B	2 May Be At Risk	4	73.0 ± 7.07
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B	2 May Be At Risk	30	14.6 ± 7.07
A	*Fulica americana*	American Coot	Not At Risk			S2B	3 Sensitive	40	35.6 ± 7.07
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B	3 Sensitive	116	35.6 ± 7.07
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		2	84.7 ± 0.01
A	*Desmognathus fuscus (QC/NB pop.)*	Northern Dusky Salamander - QC/NB pop.	Not At Risk			S3	3 Sensitive	37	52.0 ± 0.1
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S3B	1 At Risk	311	10.8 ± 0.15
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	172	45.5 ± 7.07
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	24	70.3 ± 7.07
A	*Gavia immer*	Common Loon	Not At Risk			S3B,S4N	2 May Be At Risk	47	67.3 ± 12.7
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4 Secure	10	70.3 ± 7.07
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4		2	61.8 ± 1.0
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	3	34.1 ± 1.0
A	*Lepomis auritus*	Redbreast Sunfish	Data Deficient	Special Concern		S3?	4 Secure	7	91.7 ± 10.0
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient		Endangered	SU,SH	5 Undetermined	127	8.7 ± 1.0
A	*Alces americanus*	Moose			Endangered	S1	1 At Risk	18	71.1 ± 0.01
A	*Salvelinus alpinus*	Arctic Char				S1	3 Sensitive	3	42.2 ± 1.0
A	*Lasionycteris noctivagans*	Silver-haired Bat				S1?	5 Undetermined	3	62.8 ± 1.0
A	*Bartramia longicauda*	Upland Sandpiper				S1B	3 Sensitive	33	16.9 ± 7.07
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B	3 Sensitive	32	47.9 ± 0.5
A	*Leucophaeus atricilla*	Laughing Gull				S1B	3 Sensitive	1	74.6 ± 1.0
A	*Sterna paradisaea*	Arctic Tern				S1B	2 May Be At Risk	6	61.6 ± 7.07
A	*Troglodytes aedon*	House Wren				S1B	5 Undetermined	17	45.4 ± 7.07
A	*Aythya marila*	Greater Scaup				S1B,S2N	4 Secure	22	69.6 ± 7.07
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S4N	4 Secure	13	54.5 ± 7.07
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B,S4N	4 Secure	2	70.9 ± 0.15
A	*Calidris minutilla*	Least Sandpiper				S1B,S5M	4 Secure	3	83.2 ± 0.5
A	*Butorides virescens*	Green Heron				S1S2B	3 Sensitive	12	34.9 ± 7.07
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B	3 Sensitive	4	81.6 ± 1.0
A	*Gallinula chloropus*	Common Moorhen				S1S2B	3 Sensitive	22	33.1 ± 0.15
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	3 Sensitive	80	12.2 ± 7.07
A	*Progne subis*	Purple Martin				S1S2B	2 May Be At Risk	212	5.3 ± 7.07
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	2 May Be At Risk	2	65.2 ± 7.07
A	*Charadrius semipalmatus*	Semipalmated Plover				S1S2B,S5M	4 Secure	10	69.3 ± 0.5
A	*Prosopium cylindraceum*	Round Whitefish				S2	4 Secure	1	75.1 ± 0.13
A	*Salmo salar*	Atlantic Salmon				S2	2 May Be At Risk	56	17.8 ± 0.1
A	*Pekania pennanti*	Fisher				S2	3 Sensitive	1	83.3 ± 0.01
A	*Eptesicus fuscus*	Big Brown Bat				S2?	3 Sensitive	25	34.7 ± 1.0
A	*Lasiurus borealis*	Eastern Red Bat				S2?	5 Undetermined	4	97.7 ± 1.0
A	*Lasiurus cinereus*	Hoary Bat				S2?	5 Undetermined	12	77.3 ± 1.0
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	5 Undetermined	3	74.9 ± 7.07
A	*Phalacrocorax carbo*	Great Cormorant				S2B	2 May Be At Risk	7	99.7 ± 0.5
A	*Anas clypeata*	Northern Shoveler				S2B	4 Secure	134	12.8 ± 0.15
A	*Anas strepera*	Gadwall				S2B	4 Secure	78	35.6 ± 7.07
A	*Eremophila alpestris*	Horned Lark				S2B	2 May Be At Risk	43	12.2 ± 7.07

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Cistothorus palustris*	Marsh Wren				S2B	3 Sensitive	86	35.6 ± 7.07
A	*Toxostoma rufum*	Brown Thrasher				S2B	3 Sensitive	29	22.0 ± 7.07
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	85	9.6 ± 7.07
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	125	15.5 ± 7.07
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	1	67.3 ± 12.7
A	*Chroicocephalus ridibundus*	Black-headed Gull				S2M,S1N	3 Sensitive	2	69.5 ± 0.1
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	19	27.0 ± 7.07
A	*Tringa semipalmata*	Willet				S2S3B	3 Sensitive	264	43.0 ± 0.15
A	*Icterus galbula*	Baltimore Oriole				S2S3B	2 May Be At Risk	1	94.1 ± 7.07
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S4S5N	3 Sensitive	26	35.5 ± 7.07
A	*Branta bernicla*	Brant				S2S3M,S2S3N	4 Secure	5	71.0 ± 10.0
A	*Hyla versicolor*	Gray Treefrog				S3	4 Secure	1	90.9 ± 0.1
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	22	72.9 ± 7.07
A	*Poecile hudsonica*	Boreal Chickadee				S3	3 Sensitive	49	66.0 ± 7.07
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	87	18.4 ± 0.15
A	*Coregonus clupeaformis*	Lake Whitefish				S3	4 Secure	5	45.0 ± 0.53
A	*Sorex maritimensis*	Maritime Shrew				S3	4 Secure	123	78.6 ± 0.4
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	102	27.7 ± 1.0
A	*Picoides dorsalis*	American Three-toed Woodpecker				S3?	3 Sensitive	14	15.4 ± 0.15
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3?B	2 May Be At Risk	5	70.3 ± 7.07
A	*Dendroica tigrina*	Cape May Warbler				S3?B	3 Sensitive	44	66.0 ± 7.07
A	*Podilymbus podiceps*	Pied-billed Grebe				S3B	3 Sensitive	43	72.2 ± 0.15
A	*Anas acuta*	Northern Pintail				S3B	3 Sensitive	92	35.6 ± 7.07
A	*Anas discors*	Blue-winged Teal				S3B	2 May Be At Risk	42	75.8 ± 7.07
A	*Anas americana*	American Wigeon				S3B	4 Secure	371	4.7 ± 7.07
A	*Cathartes aura*	Turkey Vulture				S3B	4 Secure	73	41.6 ± 7.07
A	*Rallus limicola*	Virginia Rail				S3B	3 Sensitive	119	35.6 ± 7.07
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	671	4.7 ± 7.07
A	*Larus delawarensis*	Ring-billed Gull				S3B	4 Secure	27	45.5 ± 7.07
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	3 Sensitive	125	22.0 ± 7.07
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	46	67.9 ± 7.07
A	*Mimus polyglottos*	Northern Mockingbird				S3B	3 Sensitive	127	16.9 ± 7.07
A	*Passerina cyanea*	Indigo Bunting				S3B	4 Secure	62	34.7 ± 0.15
A	*Molothrus ater*	Brown-headed Cowbird				S3B	2 May Be At Risk	185	12.2 ± 7.07
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N	4 Secure	87	32.5 ± 7.07
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S5M	3 Sensitive	17	85.0 ± 0.5
A	*Pluvialis dominica*	American Golden-Plover				S3M	3 Sensitive	120	57.1 ± 0.5
A	*Limosa haemastica*	Hudsonian Godwit				S3M	3 Sensitive	2	69.3 ± 0.5
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	3 Sensitive	14	69.3 ± 0.5
A	*Phalaropus lobatus*	Red-necked Phalarope				S3M	3 Sensitive	4	47.9 ± 0.5
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	2	60.0 ± 0.5
A	*Melanitta nigra*	Black Scoter				S3M,S2S3N	3 Sensitive	7	60.7 ± 1.0
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	50	60.0 ± 0.5
A	*Bucephala albeola*	Bufflehead				S3N	3 Sensitive	8	55.6 ± 15.4
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	8	74.9 ± 7.07
A	*Perisoreus canadensis*	Gray Jay				S3S4	3 Sensitive	50	70.3 ± 7.07
A	*Cardinalis cardinalis*	Northern Cardinal				S3S4	4 Secure	2	87.2 ± 7.07
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	27	75.8 ± 7.07
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	54	66.0 ± 7.07
A	*Gallinago delicata*	Wilson's Snipe				S3S4B	3 Sensitive	56	67.9 ± 7.07
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	73	66.0 ± 7.07
A	*Sayornis phoebe*	Eastern Phoebe				S3S4B	3 Sensitive	3	75.8 ± 7.07
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	349	4.7 ± 7.07
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S3S4B	3 Sensitive	426	9.2 ± 0.15
A	*Vermivora peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	56	67.9 ± 7.07
A	*Dendroica castanea*	Bay-breasted Warbler				S3S4B	3 Sensitive	53	67.9 ± 7.07

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Dendroica striata*	Blackpoll Warbler				S3S4B	3 Sensitive	16	67.9 ± 7.07
A	*Wilsonia pusilla*	Wilson's Warbler				S3S4B	3 Sensitive	26	66.0 ± 7.07
A	*Piranga olivacea*	Scarlet Tanager				S3S4B	4 Secure	84	12.2 ± 7.07
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3S4B	3 Sensitive	34	75.7 ± 7.07
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3S4B,S4S5N	3 Sensitive	175	10.3 ± 7.07
A	*Carduelis pinus*	Pine Siskin				S3S4B,S5N	3 Sensitive	43	70.3 ± 7.07
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	1	69.2 ± 0.15
A	*Aythya americana*	Redhead				SHB,SNAM	4 Secure	2	87.2 ± 7.07
I	*Coenonympha nipisiquit*	Maritime Ringlet	Endangered	Endangered	Endangered	S1	1 At Risk	1	78.7 ± 1.0
I	*Gomphus ventricosus*	Skillet Clubtail	Endangered	Endangered	Endangered	S1	2 May Be At Risk	13	18.0 ± 0.01
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1?	1 At Risk	16	54.4 ± 0.1
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S1	2 May Be At Risk	26	48.7 ± 0.1
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Special Concern	S1S2	3 Sensitive	26	9.6 ± 1.0
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	76	26.3 ± 0.0
I	*Danaus plexippus*	Monarch	Special Concern	Special Concern	Special Concern	S3B	3 Sensitive	88	30.7 ± 0.01
I	*Lyogyrus granum*	Squat Duskysnail	Data Deficient			S2		30	64.9 ± 0.01
I	*Erynnis juvenalis*	Juvenal's Duskywing				S1	5 Undetermined	1	99.6 ± 1.0
I	*Erora laeta*	Early Hairstreak				S1	2 May Be At Risk	1	41.1 ± 1.0
I	*Ophiogomphus mainensis*	Maine Snaketail				S1	2 May Be At Risk	2	78.7 ± 1.0
I	*Somatochlora franklini*	Delicate Emerald				S1	3 Sensitive	1	87.3 ± 0.01
I	*Somatochlora williamsoni*	Williamson's Emerald				S1	2 May Be At Risk	1	90.3 ± 0.01
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	7	93.7 ± 1.0
I	*Pachydiplax longipennis*	Blue Dasher				S1	5 Undetermined	1	77.1 ± 0.1
I	*Coenagrion resolutum*	Taiga Bluet				S1	2 May Be At Risk	4	85.8 ± 0.1
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				S1S2	2 May Be At Risk	28	36.6 ± 1.0
I	*Boloria eunomia*	Bog Fritillary				S1S2	5 Undetermined	1	99.8 ± 0.01
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S1S2	2 May Be At Risk	3	73.0 ± 0.01
I	*Somatochlora kennedyi*	Kennedy's Emerald				S1S2	2 May Be At Risk	3	84.7 ± 0.4
I	*Amblyscirtes vialis*	Common Roadside-Skipper				S2	4 Secure	3	88.6 ± 1.0
I	*Pieris oleracea*	Mustard White				S2	3 Sensitive	19	61.8 ± 7.07
I	*Satyrium calanus*	Banded Hairstreak				S2	3 Sensitive	2	99.8 ± 0.02
I	*Callophrys henrici*	Henry's Elfin				S2	4 Secure	8	33.7 ± 0.15
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	1	36.6 ± 1.0
I	*Cupido comyntas*	Eastern Tailed Blue				S2	4 Secure	5	49.5 ± 0.01
I	*Gomphus vastus*	Cobra Clubtail				S2	3 Sensitive	25	52.6 ± 0.03
I	*Aeshna clepsydra*	Mottled Darner				S2	3 Sensitive	5	73.1 ± 0.1
I	*Somatochlora brevicincta*	Quebec Emerald				S2	5 Undetermined	2	36.4 ± 0.01
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	4	63.6 ± 1.0
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	1	84.7 ± 0.1
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	3 Sensitive	1	83.8 ± 1.0
I	*Arigomphus furcifer*	Lilypad Clubtail				S2	5 Undetermined	6	64.5 ± 0.5
I	*Alasmidonta undulata*	Triangle Floater				S2	3 Sensitive	58	9.5 ± 0.1
I	*Lampsilis radiata*	Eastern Lampmussel				S2	3 Sensitive	13	88.7 ± 0.1
I	*Cicindela hirticollis*	Hairy-necked Tiger Beetle				S2S3	4 Secure	4	58.3 ± 0.1
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S2S3	4 Secure	17	39.3 ± 0.1
I	*Lestes vigilax*	Swamp Spreadwing				S2S3	3 Sensitive	6	77.1 ± 0.1
I	*Hesperia comma*	Common Branded Skipper				S3	4 Secure	1	85.4 ± 5.0
I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	3	87.2 ± 1.0
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	9	33.8 ± 1.0
I	*Papilio brevicauda*	Short-tailed Swallowtail				S3	4 Secure	5	76.2 ± 0.03
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	4 Secure	5	71.6 ± 0.1
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	64	35.6 ± 0.5
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	4 Secure	36	68.1 ± 0.1
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	22	34.7 ± 1.0
I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	10	20.4 ± 0.01
I	*Plebejus idas*	Northern Blue				S3	4 Secure	5	50.5 ± 1.0
I	*Plebejus saepiolus*	Greenish Blue				S3	4 Secure	2	13.7 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	9	40.0 ± 0.01
I	*Boloria bellona*	Meadow Fritillary				S3	4 Secure	18	68.6 ± 0.01
I	*Boloria chariclea*	Arctic Fritillary				S3	4 Secure	8	63.1 ± 1.0
I	*Chlosyne nycteis*	Silvery Checkerspot				S3	4 Secure	10	34.3 ± 0.25
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	6	80.6 ± 0.1
I	*Polygonia faunus*	Green Comma				S3	4 Secure	1	93.5 ± 1.0
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	4	78.7 ± 1.0
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	4 Secure	9	42.1 ± 10.0
I	*Lethe anthedon*	Northern Pearly-Eye				S3	4 Secure	16	71.1 ± 0.1
I	*Oeneis jutta*	Jutta Arctic				S3	4 Secure	37	33.6 ± 1.0
I	*Ophiogomphus carolus*	Riffle Snaketail				S3	4 Secure	1	93.8 ± 0.1
I	*Aeshna constricta*	Lance-Tipped Darner				S3	4 Secure	1	85.5 ± 0.1
I	*Dorocordulia lepida*	Petite Emerald				S3	4 Secure	13	9.8 ± 1.0
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	6	44.2 ± 1.0
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	6	43.4 ± 1.0
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	4 Secure	14	36.6 ± 1.0
I	*Nannothemis bella*	Elfin Skimmer				S3	4 Secure	11	90.8 ± 0.01
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	9	9.8 ± 1.0
I	*Enallagma geminatum*	Skimming Bluet				S3	5 Undetermined	8	47.8 ± 0.1
I	*Enallagma signatum*	Orange Bluet				S3	4 Secure	6	47.8 ± 0.1
I	*Stylurus scudderi*	Zebra Clubtail				S3	4 Secure	16	23.1 ± 1.0
I	*Leptodea ochracea*	Tidewater Mucket				S3	4 Secure	75	33.8 ± 0.0
I	*Polygonia interrogationis*	Question Mark				S3B	4 Secure	30	70.3 ± 7.07
I	*Pantala hymenaea*	Spot-Winged Glider				S3B	4 Secure	3	63.8 ± 0.1
I	*Feniseca tarquinius*	Harvester				S3S4	4 Secure	3	72.5 ± 1.0
I	*Satyrium liparops*	Striped Hairstreak				S3S4	4 Secure	10	32.2 ± 5.0
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	11	37.6 ± 0.5
I	*Speyeria atlantis*	Atlantis Fritillary				S3S4	4 Secure	1	75.7 ± 5.0
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	2	72.4 ± 0.2
I	*Megisto cymela*	Little Wood-satyr				S3S4	4 Secure	6	84.4 ± 0.5
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered		Endangered	S1	2 May Be At Risk	1	55.6 ± 1.0
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1S2	1 At Risk	2	75.0 ± 0.5
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened			S1	5 Undetermined	4	45.5 ± 1.0
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S2	4 Secure	2	75.0 ± 0.01
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S3	5 Undetermined	14	49.6 ± 0.25
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1	2 May Be At Risk	1	68.1 ± 0.1
N	*Anomodon minor*	Blunt-leaved Anomodon Moss				S1	2 May Be At Risk	1	2.2 ± 1.0
N	*Anomodon viticulosus*	a Moss				S1	2 May Be At Risk	5	0.4 ± 10.0
N	*Bartramia ithyphylla*	Straight-leaved Apple Moss				S1	2 May Be At Risk	2	48.6 ± 0.1
N	*Bryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	99.0 ± 1.0
N	*Bryum salinum*	a Moss				S1	2 May Be At Risk	1	54.4 ± 1.0
N	*Campylostelium saxicola*	a Moss				S1	2 May Be At Risk	1	98.3 ± 1.0
N	*Tortula obtusifolia*	a Moss				S1	2 May Be At Risk	1	72.7 ± 0.1
N	*Dichelyma falcatum*	a Moss				S1	2 May Be At Risk	1	98.6 ± 1.0
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1	2 May Be At Risk	1	51.2 ± 0.1
N	*Dicranum condensatum*	Condensed Broom Moss				S1	2 May Be At Risk	1	49.1 ± 10.0
N	*Didymodon rigidulus var. gracilis*	a moss				S1	2 May Be At Risk	1	55.3 ± 1.0
N	*Distichium inclinatum*	Inclined Iris Moss				S1	2 May Be At Risk	4	55.3 ± 1.0
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1	2 May Be At Risk	1	17.3 ± 1.0
N	*Drummondia prorepens*	a Moss				S1	2 May Be At Risk	1	98.3 ± 1.0
N	*Entodon brevisetus*	a Moss				S1	2 May Be At Risk	2	18.8 ± 10.0
N	*Eurhynchium hians*	Light Beaked Moss				S1	2 May Be At Risk	1	38.1 ± 0.1
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1	2 May Be At Risk	3	9.5 ± 1.0
N	*Meesia triquetra*	Three-ranked Cold Moss				S1	2 May Be At Risk	1	52.7 ± 100.0
N	*Plagiothecium latebricola*	Alder Silk Moss				S1	2 May Be At Risk	1	54.4 ± 1.0
N	*Rhytidiadelphus loreus*	Lanky Moss				S1	2 May Be At Risk	1	55.3 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S1	2 May Be At Risk	2	39.4 ± 0.1
N	*Seligeria recurvata*	a Moss				S1	2 May Be At Risk	2	9.5 ± 1.0
N	*Seligeria brevifolia*	a Moss				S1	3 Sensitive	1	95.9 ± 1.0
N	*Sphagnum strictum*	Atlantic Peat Moss				S1	2 May Be At Risk	2	20.6 ± 1.0
N	*Sphagnum subfulvum*	a Peatmoss				S1	2 May Be At Risk	1	93.7 ± 1.0
N	*Splachnum pennsylvanicum*	Southern Dung Moss				S1	2 May Be At Risk	2	78.6 ± 1.0
N	*Timmia norvegica*	a moss				S1	2 May Be At Risk	1	47.3 ± 0.1
N	*Timmia norvegica var. excurrens*	a moss				S1	2 May Be At Risk	1	55.3 ± 1.0
N	*Tortella humilis*	Small Crisp Moss				S1	2 May Be At Risk	3	40.3 ± 1.0
N	*Syntrichia ruralis*	a Moss				S1	2 May Be At Risk	1	33.2 ± 0.1
N	*Zygodon viridissimus var. viridissimus*	a Moss				S1	2 May Be At Risk	1	96.5 ± 0.1
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1	2 May Be At Risk	1	62.9 ± 1.0
N	*Hamatocaulis vernicosus*	a Moss				S1	2 May Be At Risk	1	81.5 ± 100.0
N	*Rhizomnium pseudopunctatum*	Felted Leafy Moss				S1	2 May Be At Risk	1	95.5 ± 1.0
N	*Cladonia metacorallifera*	Reptilian Pixie-cup Lichen				S1	5 Undetermined	5	45.7 ± 1.0
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S1	2 May Be At Risk	1	90.0 ± 0.1
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	2 May Be At Risk	1	45.7 ± 1.0
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	5 Undetermined	1	49.5 ± 1.0
N	*Bryoria bicolor*	Electrified Horsehair Lichen				S1	2 May Be At Risk	1	49.5 ± 1.0
N	*Anomobryum filiforme*	a moss				S1?	5 Undetermined	4	55.3 ± 1.0
N	*Anacamptodon splachnoides*	a Moss				S1S2	3 Sensitive	1	76.3 ± 1.0
N	*Andreaea rothii*	a Moss				S1S2	3 Sensitive	4	48.1 ± 1.0
N	*Brachythecium digastrum*	a Moss				S1S2	3 Sensitive	1	67.5 ± 0.1
N	*Bryum pallescens*	Pale Bryum Moss				S1S2	5 Undetermined	1	74.2 ± 100.0
N	*Didymodon ferrugineus*	a moss				S1S2	3 Sensitive	2	55.3 ± 1.0
N	*Hygrohypnum bestii*	Best's Brook Moss				S1S2	3 Sensitive	5	25.6 ± 0.1
N	*Hygrohypnum montanum*	a Moss				S1S2	3 Sensitive	2	44.5 ± 1.0
N	*Schistostega pennata*	Luminous Moss				S1S2	3 Sensitive	2	52.1 ± 100.0
N	*Seligeria campylopoda*	a Moss				S1S2	3 Sensitive	1	81.5 ± 100.0
N	*Seligeria diversifolia*	a Moss				S1S2	3 Sensitive	2	61.8 ± 0.1
N	*Sphagnum angermanicum*	a Peatmoss				S1S2	3 Sensitive	1	20.3 ± 10.0
N	*Tetrodontium brownianum*	Little Georgia				S1S2	3 Sensitive	5	51.2 ± 1.0
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S1S2	3 Sensitive	1	9.5 ± 10.0
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S1S2	3 Sensitive	4	34.8 ± 0.1
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S1S2	5 Undetermined	1	96.1 ± 0.1
N	*Sticta limbata*	Powdered Moon Lichen				S1S2	2 May Be At Risk	2	75.0 ± 0.01
N	*Peltigera scabrosa*	Greater Toad Pelt Lichen				S1S2	2 May Be At Risk	4	42.0 ± 1.0
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	6 Not Assessed	1	75.0 ± 1.0
N	*Cladopodiella francisci*	Holt's Notchwort				S1S3	6 Not Assessed	4	44.3 ± 1.0
N	*Harpanthus flotovianus*	Great Mountain Flapwort				S1S3	6 Not Assessed	2	40.4 ± 1.0
N	*Hygrobiella laxifolia*	Lax Notchwort				S1S3	6 Not Assessed	1	48.6 ± 1.0
N	*Jungermannia obovata*	Egg Flapwort				S1S3	6 Not Assessed	2	53.5 ± 0.1
N	*Lophozia ascendens*	Small Notchwort				S1S3	6 Not Assessed	3	46.5 ± 1.0
N	*Porella pinnata*	Pinnate Scalewort				S1S3	6 Not Assessed	1	68.3 ± 1.0
N	*Radula tenax*	Tenacious Scalewort				S1S3	6 Not Assessed	1	53.5 ± 0.1
N	*Scapania gymnostomophila*	Narrow-lobed Earwort				S1S3	6 Not Assessed	1	55.0 ± 1.0
N	*Tritomaria scitula*	Mountain Notchwort				S1S3	6 Not Assessed	1	51.1 ± 1.0
N	*Campylium polygamum*	a Moss				S2	3 Sensitive	1	43.7 ± 0.1
N	*Cimphyllum piliferum*	Hair-pointed Moss				S2	3 Sensitive	5	12.6 ± 5.0
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	3 Sensitive	9	41.2 ± 5.0
N	*Physcomitrium immersum*	a Moss				S2	3 Sensitive	1	68.3 ± 1.0
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S2	3 Sensitive	2	34.7 ± 0.1
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	3 Sensitive	1	98.9 ± 0.1
N	*Pohlia proligera*	Cottony Nodding Moss				S2	3 Sensitive	4	96.2 ± 0.1
N	*Pohlia sphagnicola*	a moss				S2	3 Sensitive	1	93.7 ± 0.1
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2	3 Sensitive	2	89.3 ± 0.1
N	*Sphagnum centrale*	Central Peat Moss				S2	3 Sensitive	4	40.4 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	3	80.0 ± 5.0
N	*Sphagnum flexuosum*	Flexuous Peatmoss				S2	3 Sensitive	4	44.1 ± 0.1
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	3 Sensitive	4	10.0 ± 1.0
N	*Thamnobryum alleghaniense*	a Moss				S2	3 Sensitive	9	34.8 ± 0.1
N	*Ramalina pollinaria*	Chalky Ramalina Lichen				S2	5 Undetermined	1	54.4 ± 1.0
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S2	5 Undetermined	1	54.9 ± 1.0
N	*Cladonia macrophylla*	Fig-leaved Lichen				S2	5 Undetermined	3	48.9 ± 1.0
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	3 Sensitive	1	47.7 ± 1.0
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	3 Sensitive	3	8.6 ± 5.0
N	*Ephemerum serratum*	a Moss				S2S3	3 Sensitive	2	32.2 ± 0.01
N	*Leucodon andrewsianus*	a Moss				S2S3	3 Sensitive	1	90.5 ± 0.01
N	*Sphagnum warnstorfii*	Warnstorf's Peat Moss				S2S3	3 Sensitive	2	90.4 ± 0.01
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2S3	3 Sensitive	2	74.5 ± 0.1
N	*Dendriscocaulon umhausense*	a lichen				S2S3	3 Sensitive	1	99.1 ± 0.1
N	*Nephroma bellum*	Naked Kidney Lichen				S2S3	4 Secure	3	43.3 ± 1.0
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	3 Sensitive	6	44.5 ± 0.01
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3?	5 Undetermined	1	45.1 ± 1.0
N	*Bazzania tricrenata*	Three-toothed Whipwort				S2S4		1	15.6 ± 1.0
N	*Cephaloziella divaricata*	Common Threadwort				S2S4	6 Not Assessed	3	47.6 ± 0.1
N	*Jungermannia pumila*	Dwarf Flapwort				S2S4	6 Not Assessed	1	98.3 ± 1.0
N	*Riccia fluitans*	Floating Crystalwort				S2S4	6 Not Assessed	4	68.3 ± 1.0
N	*Dicranum majus*	Greater Broom Moss				S3	4 Secure	1	95.2 ± 0.1
N	*Pleuridium subulatum*	a Moss				S3	3 Sensitive	2	32.6 ± 0.01
N	*Sphagnum compactum*	Compact Peat Moss				S3	4 Secure	1	98.5 ± 1.0
N	*Sphagnum torreyanum*	a Peatmoss				S3	4 Secure	2	55.4 ± 0.01
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3	4 Secure	1	95.2 ± 0.1
N	*Anzia colpodes*	Black-foam Lichen				S3	5 Undetermined	2	43.5 ± 1.0
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	3 Sensitive	1	99.1 ± 0.1
N	*Solorina saccata*	Woodland Owl Lichen				S3	5 Undetermined	6	54.7 ± 1.0
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	5 Undetermined	1	94.6 ± 0.1
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	5 Undetermined	6	54.9 ± 1.0
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3	4 Secure	10	54.4 ± 1.0
N	*Usnea strigosa*	Bushy Beard Lichen				S3	5 Undetermined	1	54.2 ± 1.0
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	3 Sensitive	2	43.5 ± 1.0
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	5 Undetermined	6	54.7 ± 1.0
N	*Sphagnum lescurii*	a Peatmoss				S3?	5 Undetermined	5	42.9 ± 0.1
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3?	3 Sensitive	2	75.0 ± 0.01
N	*Cladonia farinacea*	Farinose Pixie Lichen				S3?	5 Undetermined	5	50.6 ± 1.0
N	*Cladonia cameola*	Crowned Pixie-cup Lichen				S3?	5 Undetermined	1	50.6 ± 1.0
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3?S4?	4 Secure	5	45.1 ± 1.0
N	*Atrichum tenellum*	Slender Smoothcap Moss				S3S4	4 Secure	1	99.1 ± 0.1
N	*Dicranella subulata*	Awl-leaved Forklet Moss				S3S4	4 Secure	2	96.5 ± 0.1
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	1	68.2 ± 0.05
N	*Tortula truncata*	a Moss				S3S4	4 Secure	3	32.6 ± 0.01
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	3 Sensitive	1	54.4 ± 1.0
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S3S4	5 Undetermined	11	42.0 ± 1.0
N	*Melanelia panniformis*	Shingled Camouflage Lichen				S3S4	5 Undetermined	4	45.0 ± 1.0
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	4 Secure	6	45.7 ± 1.0
N	*Peltigera degenii*	Lustrous Pelt Lichen				S3S4	5 Undetermined	3	45.5 ± 1.0
N	*Pseudocyphellaria perpetua*	Gilded Specklebelly Lichen				S3S4	3 Sensitive	2	45.7 ± 1.0
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	5 Undetermined	1	76.6 ± 1.0
N	*Stereocaulon subcoralloides*	Coralloid Foam Lichen				S3S4	5 Undetermined	1	54.4 ± 1.0
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	3 Sensitive	3	43.5 ± 1.0
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	5 Undetermined	7	45.0 ± 1.0
N	*Cladonia cariosa*	Lesser Ribbed Pixie Lichen				S3S4	4 Secure	3	53.5 ± 1.0
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4?	4 Secure	3	42.9 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Phaeophyscia sciastra*	Dark Shadow Lichen				S3S4?	5 Undetermined	2	54.9 ± 1.0
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3S4?	4 Secure	5	47.7 ± 1.0
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	5 Undetermined	2	99.1 ± 10.0
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	3	89.2 ± 0.1
N	*Splachnum luteum*	Yellow Collar Moss				SH	5 Undetermined	1	74.2 ± 100.0
N	*Thelia hirtella*	a Moss				SH	2 May Be At Risk	1	52.7 ± 100.0
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				SH	2 May Be At Risk	3	23.4 ± 10.0
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				SH	5 Undetermined	1	45.0 ± 0.01
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	53	0.0 ± 2.0
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	3	91.3 ± 0.1
P	*Symphyotrichum subulatum (Bathurst pop)*	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	20	77.0 ± 0.1
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	1	94.6 ± 0.05
P	*Lechea maritima var. subcylindrica*	Beach Pinweed	Special Concern			S2	3 Sensitive	392	75.3 ± 0.1
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	At Risk	5	73.3 ± 0.01
P	*Cryptotaenia canadensis*	Canada Honewort				S1	2 May Be At Risk	2	33.4 ± 1.0
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S1	2 May Be At Risk	1	64.8 ± 5.0
P	*Antennaria rosea ssp. arida*	Rosy Pussytoes				S1	2 May Be At Risk	1	89.0 ± 0.5
P	*Antennaria parlinii*	a Pussytoes				S1	2 May Be At Risk	5	59.9 ± 1.0
P	*Bidens discoidea*	Swamp Beggarticks				S1	2 May Be At Risk	3	74.4 ± 0.05
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2 May Be At Risk	6	53.7 ± 0.5
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	2 May Be At Risk	2	57.3 ± 0.5
P	*Hieracium robinsonii*	Robinson's Hawkweed				S1	3 Sensitive	5	47.4 ± 0.01
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S1	2 May Be At Risk	10	50.3 ± 0.5
P	*Ageratina altissima*	White Snakeroot				S1	2 May Be At Risk	8	78.7 ± 1.0
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S1	2 May Be At Risk	7	73.7 ± 0.5
P	*Draba arabisans*	Rock Whitlow-Grass				S1	2 May Be At Risk	18	57.1 ± 0.5
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	11	55.3 ± 0.01
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	2	66.1 ± 5.0
P	*Chenopodium capitatum*	Strawberry-blite				S1	2 May Be At Risk	3	57.6 ± 1.0
P	*Chenopodium simplex*	Maple-leaved Goosefoot				S1	2 May Be At Risk	6	14.0 ± 5.0
P	*Suaeda rolandii*	Roland's Sea-Blite				S1	3 Sensitive	3	58.9 ± 0.1
P	*Triadenum virginicum*	Virginia St John's-wort				S1	2 May Be At Risk	2	92.9 ± 0.05
P	*Cuscuta pentagona*	Five-angled Dodder				S1	2 May Be At Risk	6	55.1 ± 5.0
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	2	94.3 ± 10.0
P	*Astragalus robbinsii var. minor*	Robbins' Milkvetch				S1	2 May Be At Risk	14	79.8 ± 0.1
P	*Lespedeza capitata*	Round-headed Bush-clover				S1	2 May Be At Risk	5	53.5 ± 0.01
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	2 May Be At Risk	4	67.2 ± 0.5
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	2 May Be At Risk	11	56.9 ± 0.01
P	*Primula laurentiana*	Laurentian Primrose				S1	2 May Be At Risk	19	55.3 ± 0.5
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S1	2 May Be At Risk	1	41.7 ± 1.0
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	2 May Be At Risk	1	46.0 ± 1.0
P	*Dryas integrifolia*	Entire-leaved Mountain Avens				S1	2 May Be At Risk	11	52.4 ± 3.0
P	*Potentilla canadensis*	Canada Cinquefoil				S1	5 Undetermined	1	47.9 ± 0.01
P	*Waldsteinia fragarioides*	Barren Strawberry				S1	2 May Be At Risk	1	75.1 ± 1.0
P	*Salix myrtillifolia*	Blueberry Willow				S1	2 May Be At Risk	24	52.2 ± 0.05
P	*Saxifraga paniculata ssp. neogaea*	White Mountain Saxifrage				S1	2 May Be At Risk	24	39.2 ± 1.0
P	*Agalinis paupercula var. borealis*	Small-flowered Agalinis				S1	2 May Be At Risk	10	77.2 ± 1.0
P	*Agalinis tenuifolia*	Slender Agalinis				S1	2 May Be At Risk	8	97.0 ± 0.5
P	*Alisma subcordatum*	Southern Water Plantain				S1	5 Undetermined	2	69.8 ± 0.4
P	*Carex annectens*	Yellow-Fruited Sedge				S1	2 May Be At Risk	2	73.8 ± 0.01
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	2 May Be At Risk	1	55.0 ± 0.01
P	*Carex backii*	Rocky Mountain Sedge				S1	2 May Be At Risk	3	31.9 ± 0.01
P	*Carex comosa*	Bearded Sedge				S1	2 May Be At Risk	7	83.4 ± 0.01
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	2 May Be At Risk	1	86.5 ± 7.07
P	*Carex livida var. radicaulis*	Livid Sedge				S1	2 May Be At Risk	4	90.4 ± 0.01
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	2 May Be At Risk	1	32.0 ± 0.01
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	11	77.6 ± 10.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Carex sterilis*	Sterile Sedge				S1	2 May Be At Risk	1	3.9 ± 2.0
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	9	34.2 ± 5.0
P	*Cyperus diandrus*	Low Flatsedge				S1	2 May Be At Risk	2	99.2 ± 1.0
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	2	58.6 ± 0.01
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	16	58.4 ± 0.5
P	*Scirpus pendulus*	Hanging Bulrush				S1	2 May Be At Risk	5	4.3 ± 0.5
P	*Schoenoplectus smithii*	Smith's Bulrush				S1	2 May Be At Risk	1	99.5 ± 0.01
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	2	63.4 ± 10.0
P	*Juncus stygius*	Moor Rush				S1	2 May Be At Risk	1	76.7 ± 0.01
P	*Juncus stygius ssp. americanus*	Moor Rush				S1	2 May Be At Risk	15	63.4 ± 10.0
P	*Juncus subtilis*	Creeping Rush				S1	2 May Be At Risk	1	70.3 ± 5.0
P	*Allium canadense*	Canada Garlic				S1	2 May Be At Risk	2	67.2 ± 0.5
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	5	13.8 ± 5.0
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	1	86.5 ± 0.5
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	2 May Be At Risk	2	94.5 ± 10.0
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	2 May Be At Risk	2	39.8 ± 1.2
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S1	2 May Be At Risk	6	68.2 ± 0.1
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	2 May Be At Risk	2	83.0 ± 1.0
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	2 May Be At Risk	5	57.4 ± 1.0
P	*Danthonia compressa*	Flattened Oat Grass				S1	2 May Be At Risk	1	34.3 ± 1.5
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	2 May Be At Risk	1	74.9 ± 1.0
P	*Festuca subverticillata*	Nodding Fescue				S1	2 May Be At Risk	1	80.1 ± 1.0
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	2 May Be At Risk	6	82.2 ± 0.01
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2 May Be At Risk	2	63.8 ± 2.0
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	5 Undetermined	3	93.0 ± 0.1
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	2 May Be At Risk	3	86.1 ± 0.1
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	2 May Be At Risk	1	39.9 ± 1.0
P	*Dryopteris filix-mas*	Male Fern				S1	2 May Be At Risk	2	38.1 ± 1.0
P	*Botrychium oneidense*	Blunt-lobed Moonwort				S1	2 May Be At Risk	3	81.5 ± 5.0
P	*Schizaea pusilla*	Little Curlygrass Fern				S1	2 May Be At Risk	9	46.6 ± 0.01
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1?	2 May Be At Risk	6	59.3 ± 0.01
P	*Wolffia columbiana*	Columbian Watermeal				S1?	2 May Be At Risk	4	79.4 ± 0.5
P	*Dichanthelium acuminatum var. lindheimeri*	Woolly Panic Grass				S1?	5 Undetermined	1	79.9 ± 0.5
P	*Huperzia selago*	Northern Firmoss				S1?	May Be At Risk	1	87.4 ± 0.5
P	*Fraxinus nigra*	Black Ash			Threatened	S1S2	At Risk	4	90.1 ± 1.0
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	May Be At Risk	1	90.5 ± 7.07
P	*Humulus lupulus var. lupuloides*	Common Hop				S1S2	3 Sensitive	2	67.2 ± 5.0
P	*Pyrola chlorantha*	Green-flowered Pyrola				S1S2	2 May Be At Risk	1	99.9 ± 0.01
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S1S2	3 Sensitive	1	93.4 ± 0.5
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S1S2	3 Sensitive	2	40.4 ± 0.01
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S1S2	3 Sensitive	3	90.1 ± 0.01
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	3 Sensitive	6	87.5 ± 1.0
P	*Selaginella rupestris*	Rock Spikemoss				S1S2	2 May Be At Risk	7	34.3 ± 1.5
P	*Thelypteris simulata*	Bog Fern				S1S2	2 May Be At Risk	7	58.7 ± 0.2
P	*Listera australis*	Southern Twayblade			Endangered	S2	1 At Risk	35	68.2 ± 0.01
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3 Sensitive	5	82.5 ± 0.01
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	3 Sensitive	3	85.2 ± 0.5
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3 Sensitive	3	13.8 ± 5.0
P	*Solidago altissima*	Tall Goldenrod				S2	4 Secure	3	60.3 ± 0.5
P	*Ionactis linariifolius*	Stiff Aster				S2	3 Sensitive	21	81.2 ± 0.01
P	*Symphyotrichum racemosum*	Small White Aster				S2	3 Sensitive	7	48.5 ± 5.0
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	Sensitive	3	86.7 ± 1.0
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	3	73.7 ± 0.01
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	2 May Be At Risk	2	93.5 ± 1.0
P	*Alnus serrulata*	Smooth Alder				S2	3 Sensitive	8	61.7 ± 0.01
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	11	32.0 ± 0.01
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	9	47.9 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Atriplex franktonii*	Frankton's Saltbush				S2	4 Secure	4	57.3 ± 1.0
P	*Chenopodium rubrum*	Red Pigweed				S2	3 Sensitive	8	70.6 ± 1.0
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2	4 Secure	9	41.3 ± 0.01
P	*Hypericum dissimulatum*	Disguised St John's-wort				S2	3 Sensitive	2	43.8 ± 1.0
P	*Shepherdia canadensis*	Soapberry				S2	3 Sensitive	5	52.2 ± 1.6
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	2 May Be At Risk	4	76.2 ± 0.5
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	14	52.4 ± 0.5
P	*Quercus macrocarpa*	Bur Oak				S2	2 May Be At Risk	33	52.0 ± 1.0
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	3 Sensitive	1	58.7 ± 50.0
P	*Myriophyllum humile*	Low Water Milfoil				S2	3 Sensitive	5	40.3 ± 1.0
P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4 Secure	5	34.5 ± 0.5
P	*Nuphar lutea ssp. rubrodisca*	Red-disked Yellow Pond-lily				S2	3 Sensitive	12	45.8 ± 0.02
P	*Orobanche uniflora*	One-Flowered Broomrape				S2	3 Sensitive	7	75.9 ± 1.0
P	*Polygala paucifolia*	Fringed Milkwort				S2	3 Sensitive	7	22.9 ± 1.0
P	*Polygala sanguinea*	Blood Milkwort				S2	3 Sensitive	35	13.5 ± 5.0
P	*Polygonum amphibium var. emersum*	Water Smartweed				S2	3 Sensitive	7	55.5 ± 1.0
P	*Polygonum careyi*	Carey's Smartweed				S2	3 Sensitive	11	51.5 ± 1.0
P	*Rumex salicifolius var. mexicanus*	Triangular-valve Dock				S2	3 Sensitive	1	99.1 ± 1.0
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S2	3 Sensitive	5	99.2 ± 0.05
P	*Anemone parviflora*	Small-flowered Anemone				S2	3 Sensitive	8	52.9 ± 5.0
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S2	3 Sensitive	1	45.7 ± 1.0
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S2	4 Secure	14	64.9 ± 1.0
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	10	30.5 ± 1.0
P	*Sanguisorba canadensis*	Canada Burnet				S2	4 Secure	15	49.6 ± 0.5
P	*Cephalanthus occidentalis*	Common Buttonbush				S2	3 Sensitive	19	62.9 ± 0.07
P	*Galium boreale*	Northern Bedstraw				S2	2 May Be At Risk	3	96.9 ± 7.07
P	*Salix sericea*	Silky Willow				S2	2 May Be At Risk	1	79.8 ± 0.1
P	*Euphrasia randii*	Rand's Eyebright				S2	2 May Be At Risk	2	57.3 ± 0.1
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3 Sensitive	4	33.8 ± 5.0
P	*Dirca palustris*	Eastern Leatherwood				S2	2 May Be At Risk	1	49.2 ± 1.0
P	*Viola novae-angliae*	New England Violet				S2	3 Sensitive	3	74.0 ± 0.01
P	*Sagittaria calycina var. spongiosa*	Long-lobed Arrowhead				S2	4 Secure	53	58.6 ± 0.01
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	3 Sensitive	94	72.1 ± 5.0
P	*Carex granularis*	Limestone Meadow Sedge				S2	3 Sensitive	3	33.3 ± 5.0
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	1	34.3 ± 1.5
P	*Carex hirtifolia*	Pubescent Sedge				S2	3 Sensitive	4	13.0 ± 5.0
P	*Carex hystericina*	Porcupine Sedge				S2	2 May Be At Risk	1	95.3 ± 1.0
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	2	37.2 ± 0.5
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	1	12.8 ± 10.0
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	8	53.5 ± 0.01
P	*Carex vacillans*	Estuarine Sedge				S2	3 Sensitive	1	82.0 ± 0.01
P	*Cyperus squarrosus*	Awned Flatsedge				S2	3 Sensitive	24	55.8 ± 1.0
P	*Eriophorum gracile*	Slender Cottongrass				S2	2 May Be At Risk	29	63.5 ± 10.0
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	6	88.8 ± 0.01
P	*Elodea nuttallii*	Nuttall's Waterweed				S2	3 Sensitive	4	68.4 ± 0.5
P	*Juncus vaseyi*	Vasey Rush				S2	3 Sensitive	8	29.7 ± 0.1
P	*Lemna trisulca*	Star Duckweed				S2	4 Secure	24	10.0 ± 1.0
P	*Allium tricoccum*	Wild Leek				S2	2 May Be At Risk	9	12.9 ± 5.0
P	*Lilium canadense*	Canada Lily				S2	May Be At Risk	5	82.4 ± 7.07
P	*Najas gracillima*	Thread-Like Naiad				S2	3 Sensitive	3	73.1 ± 0.1
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	8	8.1 ± 5.0
P	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid				S2	2 May Be At Risk	6	30.4 ± 0.5
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	1	77.2 ± 1.6
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2	3 Sensitive	7	57.8 ± 1.0
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	12	13.1 ± 1.0
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	2	44.0 ± 0.01
P	*Elymus canadensis*	Canada Wild Rye				S2	2 May Be At Risk	2	33.2 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Leersia virginica*	White Cut Grass				S2	2 May Be At Risk	34	66.7 ± 0.01
P	*Piptatherum canadense*	Canada Rice Grass				S2	3 Sensitive	4	13.1 ± 10.0
P	*Puccinellia laurentiana*	Nootka Alkali Grass				S2	3 Sensitive	1	93.8 ± 10.0
P	*Puccinellia phryganodes*	Creeping Alkali Grass				S2	3 Sensitive	2	58.6 ± 0.5
P	*Schizachyrium scoparium*	Little Bluestem				S2	3 Sensitive	27	44.8 ± 0.01
P	*Zizania aquatica var. aquatica*	Indian Wild Rice				S2	5 Undetermined	5	41.5 ± 1.0
P	*Piptatherum pungens*	Slender Rice Grass				S2	2 May Be At Risk	5	31.9 ± 0.01
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2	3 Sensitive	6	70.9 ± 1.0
P	*Potamogeton friesii*	Fries' Pondweed				S2	2 May Be At Risk	1	84.1 ± 0.1
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	3 Sensitive	14	53.6 ± 0.01
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	3 Sensitive	6	32.1 ± 1.0
P	*Woodwardia virginica*	Virginia Chain Fern				S2	3 Sensitive	2	88.8 ± 0.01
P	*Woodsia alpina*	Alpine Cliff Fern				S2	3 Sensitive	7	45.1 ± 0.01
P	*Lycopodium sitchense*	Sitka Clubmoss				S2	3 Sensitive	4	59.6 ± 5.0
P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	7	47.0 ± 5.0
P	*Toxicodendron radicans*	Poison Ivy				S2?	3 Sensitive	12	45.2 ± 0.01
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2?	3 Sensitive	4	69.6 ± 0.02
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	5	52.8 ± 0.1
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	5	83.2 ± 1.0
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2?	4 Secure	14	25.4 ± 1.0
P	*Rubus recurvicaulis*	Arching Dewberry				S2?	4 Secure	6	50.1 ± 1.0
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	10	53.9 ± 10.0
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	4	52.6 ± 1.5
P	*Eleocharis ovata*	Ovate Spikerush				S2?	3 Sensitive	3	89.1 ± 0.01
P	*Eragrostis pectinacea*	Tufted Love Grass				S2?	4 Secure	7	0.3 ± 0.01
P	*Betula pumila var. pumila*	Bog Birch				S2S3	3 Sensitive	1	84.9 ± 1.0
P	*Ceratophyllum echinatum*	Prickly Hornwort				S2S3	3 Sensitive	24	46.8 ± 0.03
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	11	59.0 ± 0.01
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	21	42.6 ± 0.01
P	*Geranium robertianum*	Herb Robert				S2S3	4 Secure	28	50.1 ± 1.0
P	*Myriophyllum quitense*	Andean Water Milfoil				S2S3	4 Secure	69	63.8 ± 0.01
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	4	61.3 ± 0.01
P	*Galium aparine*	Common Bedstraw				S2S3	Sensitive	1	85.9 ± 8.0
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	2	14.1 ± 0.5
P	*Populus balsamifera*	Balsam Poplar				S2S3	3 Sensitive	1	99.8 ± 0.01
P	*Salix pellita*	Satiny Willow				S2S3	Sensitive	4	77.2 ± 5.0
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	10	42.6 ± 10.0
P	*Carex tonsa var. rugosperma*	Deep Green Sedge				S2S3	3 Sensitive	1	99.9 ± 0.01
P	*Elodea canadensis*	Canada Waterweed				S2S3	Secure	11	88.0 ± 0.01
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	3 Sensitive	6	30.1 ± 1.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	2	83.0 ± 0.01
P	*Listera auriculata*	Auricled Twayblade				S2S3	3 Sensitive	1	47.8 ± 0.1
P	*Calamagrostis stricta var. stricta*	Slim-stemmed Reed Grass				S2S3	3 Sensitive	1	100.0 ± 0.01
P	*Poa glauca*	Glaucous Blue Grass				S2S3	3 Sensitive	7	86.4 ± 0.5
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	12	67.6 ± 0.01
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S2S3	Sensitive	10	86.0 ± 1.0
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	5	34.2 ± 5.0
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	17	41.5 ± 0.5
P	*Artemisia campestris*	Field Wormwood				S3	4 Secure	4	57.3 ± 0.2
P	*Artemisia campestris ssp. caudata*	Field Wormwood				S3	4 Secure	74	50.2 ± 0.01
P	*Bidens hyperborea*	Estuary Beggarticks				S3	4 Secure	17	54.4 ± 0.5
P	*Bidens hyperborea var. hyperborea*	Estuary Beggarticks				S3	4 Secure	3	53.9 ± 1.0
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	39	29.4 ± 0.5
P	*Megalodonta beckii*	Water Beggarticks				S3	Secure	7	88.5 ± 0.5
P	*Prenanthes racemosa*	Glaucous Rattlesnakeroot				S3	4 Secure	46	44.4 ± 0.01
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	4 Secure	10	62.6 ± 0.01
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	5	14.2 ± 0.5

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Betula pumila*	Bog Birch				S3	4 Secure	20	28.7 ± 0.5
P	*Arabis glabra*	Tower Mustard				S3	5 Undetermined	2	57.3 ± 0.5
P	*Arabis hirsuta var. pycnocarpa*	Western Hairy Rockcress				S3	4 Secure	13	32.0 ± 1.0
P	*Cardamine maxima*	Large Toothwort				S3	4 Secure	22	56.6 ± 0.5
P	*Rorippa palustris*	Bog Yellowcress				S3	5 Undetermined	1	99.8 ± 0.01
P	*Subularia aquatica var. americana*	Water Awlwort				S3	4 Secure	2	39.7 ± 0.01
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	4	86.5 ± 0.1
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	14	52.7 ± 0.1
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	127	63.5 ± 50.0
P	*Cornus amomum ssp. obliqua*	Pale Dogwood				S3	3 Sensitive	54	44.9 ± 0.01
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	9	59.1 ± 0.01
P	*Rhodiola rosea*	Roseroot				S3	4 Secure	18	47.5 ± 0.5
P	*Penthorum sedoides*	Ditch Stonecrop				S3	4 Secure	31	41.7 ± 1.0
P	*Elatine minima*	Small Waterwort				S3	4 Secure	7	40.4 ± 0.01
P	*Vaccinium boreale*	Northern Blueberry				S3	Sensitive	4	68.5 ± 0.5
P	*Hedysarum alpinum*	Alpine Sweet-vetch				S3	4 Secure	2	76.4 ± 0.5
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	13	4.2 ± 0.5
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	4 Secure	12	41.1 ± 0.01
P	*Myriophyllum heterophyllum*	Variable-leaved Water Milfoil				S3	4 Secure	48	44.4 ± 0.01
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	25	44.3 ± 0.6
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3	4 Secure	26	38.7 ± 0.1
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3	Secure	1	93.3 ± 5.0
P	*Stachys tenuifolia*	Smooth Hedge-Nettle				S3	3 Sensitive	4	64.9 ± 0.5
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	50	62.3 ± 0.01
P	*Nuphar lutea ssp. pumila*	Small Yellow Pond-lily				S3	4 Secure	17	64.5 ± 1.0
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	3	49.8 ± 1.0
P	*Epilobium hornemannii ssp. hornemannii*	Hornemann's Willowherb				S3	4 Secure	1	49.0 ± 0.1
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	15	64.4 ± 5.0
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S3	4 Secure	38	15.0 ± 1.0
P	*Polygonum pensylvanicum*	Pennsylvania Smartweed				S3	4 Secure	1	81.8 ± 0.1
P	*Polygonum punctatum*	Dotted Smartweed				S3	4 Secure	3	73.7 ± 0.01
P	*Polygonum punctatum var. confertiflorum*	Dotted Smartweed				S3	4 Secure	12	58.4 ± 0.03
P	*Polygonum scandens*	Climbing False Buckwheat				S3	4 Secure	41	50.1 ± 5.0
P	*Rumex maritimus*	Sea-Side Dock				S3	4 Secure	28	39.7 ± 1.0
P	*Littorella uniflora*	American Shoreweed				S3	4 Secure	7	59.9 ± 1.0
P	*Primula mistassinica*	Mistassini Primrose				S3	4 Secure	8	76.1 ± 0.1
P	*Samolus valerandi*	Seaside Brookweed				S3	4 Secure	1	83.7 ± 0.01
P	*Samolus valerandi ssp. parviflorus*	Seaside Brookweed				S3	4 Secure	62	55.8 ± 0.01
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	4	44.7 ± 1.0
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	11	31.8 ± 0.2
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	31	16.2 ± 0.1
P	*Thalictrum venulosum*	Northern Meadow-rue				S3	4 Secure	66	55.8 ± 1.0
P	*Rhamnus alnifolia*	Alder-leaved Buckthorn				S3	Secure	22	90.7 ± 0.01
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	7	62.7 ± 0.01
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	18	34.5 ± 1.0
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	13	39.3 ± 5.0
P	*Rubus chamaemorus*	Cloudberry				S3	4 Secure	15	46.5 ± 0.4
P	*Rubus occidentalis*	Black Raspberry				S3	4 Secure	3	56.7 ± 0.5
P	*Salix interior*	Sandbar Willow				S3	4 Secure	11	44.5 ± 1.8
P	*Salix nigra*	Black Willow				S3	3 Sensitive	118	37.5 ± 50.0
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	35	13.8 ± 5.0
P	*Salix petiolaris*	Meadow Willow				S3	4 Secure	5	77.3 ± 3.0
P	*Comandra umbellata*	Bastard's Toadflax				S3	4 Secure	35	58.7 ± 10.0
P	*Geocaulon lividum*	Northern Comandra				S3	4 Secure	28	47.3 ± 1.5
P	*Pamassia glauca*	Fen Grass-of-Parnassus				S3	4 Secure	1	99.2 ± 0.01
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	47	54.3 ± 0.01
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	Secure	3	89.1 ± 0.01

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S3	4 Secure	11	50.4 ± 0.01
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	3 Sensitive	4	73.2 ± 0.01
P	*Pilea pumila*	Dwarf Clearweed				S3	4 Secure	19	9.2 ± 0.01
P	*Viola adunca*	Hooked Violet				S3	4 Secure	7	31.9 ± 0.01
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	3	56.4 ± 1.0
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	32	13.0 ± 5.0
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	15	47.5 ± 0.01
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	53	38.2 ± 0.1
P	*Carex conoidea*	Field Sedge				S3	4 Secure	18	24.2 ± 1.0
P	*Carex eburnea*	Bristle-leaved Sedge				S3	4 Secure	2	38.9 ± 100.0
P	*Carex exilis*	Coastal Sedge				S3	4 Secure	5	55.1 ± 0.01
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	3	70.0 ± 0.5
P	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	22	41.7 ± 0.05
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	61	43.6 ± 0.01
P	*Carex michauxiana*	Michaux's Sedge				S3	4 Secure	18	40.8 ± 0.01
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	6	16.2 ± 1.0
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	17	31.8 ± 0.5
P	*Carex tenera*	Tender Sedge				S3	4 Secure	40	6.0 ± 0.5
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	54	12.8 ± 5.0
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	103	13.1 ± 10.0
P	*Carex recta*	Estuary Sedge				S3	4 Secure	12	53.5 ± 0.01
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	100	44.7 ± 0.01
P	*Cyperus esculentus*	Perennial Yellow Nutsedge				S3	4 Secure	35	9.2 ± 0.01
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	1	24.3 ± 0.5
P	*Eleocharis nitida*	Quill Spikerush				S3	4 Secure	6	88.0 ± 1.0
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	2	89.1 ± 0.5
P	*Eriophorum chamissonis*	Russet Cotton-Grass				S3	4 Secure	109	46.3 ± 0.01
P	*Rhynchospora capitellata*	Small-headed Beaknush				S3	4 Secure	11	47.6 ± 1.0
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	8	42.6 ± 0.01
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	17	47.5 ± 0.01
P	*Schoenoplectus fluviatilis*	River Bulrush				S3	3 Sensitive	41	56.9 ± 0.03
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	4 Secure	18	45.0 ± 0.01
P	*Triglochin gaspensis*	Gaspé Arrowgrass				S3	4 Secure	30	54.8 ± 0.01
P	*Juncus dudleyi*	Dudley's Rush				S3	Secure	1	99.5 ± 0.01
P	*Maianthemum stellatum*	Starry False Solomon's Seal				S3	4 Secure	1	100.0 ± 0.1
P	*Tofieldia glutinosa*	Sticky False-Asphodel				S3	4 Secure	5	76.6 ± 0.5
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	7	14.5 ± 0.5
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	15	71.9 ± 1.0
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	10	3.0 ± 1.0
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	30	33.7 ± 0.05
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	14	21.3 ± 1.0
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	2	98.0 ± 5.0
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	Secure	2	80.8 ± 7.07
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	6	9.8 ± 0.1
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	4 Secure	5	9.7 ± 0.5
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	15	49.9 ± 0.01
P	*Heteranthera dubia*	Water Stargrass				S3	4 Secure	46	57.7 ± 0.01
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	25	40.4 ± 0.01
P	*Sparganium natans*	Small Burreed				S3	4 Secure	3	77.5 ± 0.5
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	19	18.4 ± 5.0
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	25	56.4 ± 0.01
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	4 Secure	1	45.7 ± 1.0
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	4 Secure	2	67.2 ± 0.1
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S3	4 Secure	15	32.0 ± 1.0
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S3	4 Secure	37	40.4 ± 1.0
P	*Woodsia glabella*	Smooth Cliff Fern				S3	4 Secure	24	42.8 ± 0.1
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	1	94.9 ± 10.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Equisetum pratense*	Meadow Horsetail				S3	Sensitive	1	92.5 ± 0.01
P	*Equisetum variegatum*	Variegated Horsetail				S3	4 Secure	9	88.8 ± 0.05
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	6	42.6 ± 0.01
P	*Lycopodium sabinifolium*	Ground-Fir				S3	4 Secure	22	44.4 ± 0.01
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	3 Sensitive	17	47.6 ± 0.01
P	*Botrychium dissectum*	Cut-leaved Moonwort				S3	4 Secure	16	51.5 ± 1.0
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S3	3 Sensitive	8	35.8 ± 5.0
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	5	74.9 ± 0.05
P	*Polypodium appalachianum*	Appalachian Polypody				S3	4 Secure	13	29.7 ± 1.0
P	*Utricularia resupinata*	Inverted Bladderwort				S3?	4 Secure	4	83.1 ± 1.0
P	*Crataegus submollis*	Quebec Hawthorn				S3?	3 Sensitive	7	57.4 ± 1.0
P	*Carex foenea*	Fernald's Hay Sedge				S3?	4 Secure	1	99.9 ± 3.0
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	8	51.8 ± 10.0
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	26	44.4 ± 5.0
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	5	67.7 ± 0.01
P	*Sanguinaria canadensis*	Bloodroot				S3S4	4 Secure	1	94.9 ± 5.0
P	*Potentilla arguta*	Tall Cinquefoil				S3S4	4 Secure	2	77.0 ± 0.5
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	4 Secure	7	81.4 ± 0.5
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	Secure	2	80.9 ± 5.0
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	4 Secure	4	74.4 ± 5.0
P	*Spirodela polyrrhiza*	Great Duckweed				S3S4	4 Secure	35	53.7 ± 0.01
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	16	27.9 ± 0.01
P	*Distichlis spicata*	Salt Grass				S3S4	4 Secure	51	29.4 ± 1.0
P	*Panicum tuckermanii*	Tuckerman's Panic Grass				S3S4	Secure	1	97.9 ± 0.1
P	*Trisetum spicatum*	Narrow False Oats				S3S4	4 Secure	2	88.0 ± 1.0
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	16	45.3 ± 10.0
P	*Stuckenia pectinata*	Sago Pondweed				S3S4	4 Secure	56	13.0 ± 5.0
P	*Equisetum hyemale var. affine*	Common Scouring-rush				S3S4	4 Secure	2	98.5 ± 1.5
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	4 Secure	1	92.6 ± 0.01
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	3	65.5 ± 1.0
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	99.2 ± 1.0
P	*Agalinis maritima*	Saltmarsh Agalinis				SX	0.1 Extirpated	2	87.1 ± 50.0

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these 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	CITATION
5786	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3307	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
1334	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
450	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
445	Gravel, Mireille. 2010. Coordonnées GPS et suivi des tortues marquées, 2005-07. Kouchibouguac National Park, 480 recs.
411	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
408	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
401	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
317	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
307	Blaney, C.S.; Mazerolle, D.M., Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
303	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
263	Blaney, C.S. & Mazerolle, D.M. 2011. Field data from NCC properties at Musquash Harbour NB & Goose Lake NS. Atlantic Canada Conservation Data Centre, 1739 recs.
241	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
236	Beaudet, A. 2007. Piping Plover Records in Kouchibouguac NP, 1982-2005. Kouchibouguac National Park, 435 recs.
209	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
193	Sollows, M.C. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.

# recs	CITATION
189	Blaney, C.S., Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
177	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
176	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
174	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
162	Epworth, W. 2012. Species at Risk records, 2009-11. Fort Folly Habitat Recovery Program, 162 recs.
158	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
141	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
136	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
130	Sollows, M.C., 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
129	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
125	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
115	Mazerolle, D.M. 2005. Bouctouche Irving Eco-Centre rare coastal plant fieldwork results 2004-05. Irving Eco-centre, la Dune du Bouctouche, 174 recs.
114	Bishop, G. & Papoulias, M., Arnold (Chaplin), M. 2005. Grand Lake Meadows field notes, Summer 2005. New Brunswick Federation of Naturalists, 1638 recs.
107	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
107	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
100	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
86	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.
83	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
80	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
79	Bateman, M.C. 2000. Waterfowl Brood Surveys Database, 1990-2000 . Canadian Wildlife Service, Sackville, unpublished data. 149 recs.
78	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
78	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
78	Sabine, D.L. 2005. 2001 Freshwater Mussel Surveys. New Brunswick Dept of Natural Resources & Energy, 590 recs.
76	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
76	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
76	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
57	Tremblay, E. 2006. Kouchibouguac National Park Digital Database. Parks Canada, 105 recs.
54	McAlpine, D.F. 1998. NBM Science Collections: Wood Turtle records. New Brunswick Museum, Saint John NB, 329 recs.
54	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
53	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.
49	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
49	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
49	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
48	Spicer, C.D. & Harries, H. 2001. Mount Allison Herbarium Specimens. Mount Allison University, 128 recs.
41	Wissink, R. 2006. Fundy National Park Digital Database. Parks Canada, 41 recs.
40	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
37	Allen, K. 2012. Rare plant spatial data from Pleasant Ridge cranberry farm. NB Deparment of Environment, Environmental Assessment Section, 39 recs.
37	Clayden, S.R. 2012. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 57 recs.
37	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
34	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
34	Robinson, S.L. 2010. Fieldwork 2009 (dune ecology). Atlantic Canada Conservation Data Centre. Sackville NB, 408 recs.
32	Donell, R. 2008. Rare plant records from rare coastal plant project. Bouctouche Dune Irving Eco-centre. Pers. comm. to D.M. Mazerolle, 50 recs.
32	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.
31	Coursol, F. 2005. Dataset from New Brunswick fieldwork for Eriocaulon parkeri COSEWIC report. Coursol, Pers. comm. to C.S. Blaney, Aug 26. 110 recs.
31	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
31	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/buttrfly. 142 recs.
29	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
29	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
27	Newell, R. E. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University. 2013.
26	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
26	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
26	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
26	Majka, C. 2009. Université de Moncton Insect Collection: Carabidae, Cerambycidae, Coccinellidae. Université de Moncton, 540 recs.
25	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09. 304 recs.
23	Doucet, D.A. & Edsall, J.; Brunelle, P.-M. 2007. Miramichi Watershed Rare Odonata Survey. New Brunswick ETF & WTF Report, 1211 recs.
23	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
22	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.

# recs	CITATION
22	Doucet, D.A. 2008. Fieldwork 2008: Odonata. ACCDC Staff, 625 recs.
22	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
21	Doucet, D.A. & Edsall, J. 2007. Ophiogomphus howei records. Atlantic Canada Conservation Data Centre, Sackville NB, 21 recs.
	Wood Turtle (Glyptemys insculpta) Miramichi Watershed Synopsis 2013
21	Compiled by: Vladimir King Trajkovic, EPt
	Miramichi River Environmental Assessment Committee
20	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2009. New Brunswick Dept Natural Resources, 19 recs (14 active).
19	Kouchibouguac National Park, Natural Resource Conservation Sec. 1988. The Resources of Kouchibouguac National Park. Beach, H. (ed.) , 90 recs.
19	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.
18	Belland, R.J. 1992. The Bryophytes of Kouchibouguac National Park. Parks Canada, Kouchibouguac NP, 101 pp. + map.
18	Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs.
18	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
17	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
17	Mazerolle, D. 2003. Assessment of Seaside Pinweed (Lechea maritima var. subcylindrica) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 18 recs.
16	Benedict, B. Connell Herbarium Specimens, Digital photos. University New Brunswick, Fredericton. 2005.
16	Caissie, A. Herbarium Records. Fundy National Park, Alma NB. 1961-1993.
16	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
16	McAlpine, D.F. 1983. Status & Conservation of Solution Caves in New Brunswick. New Brunswick Museum, Publications in Natural Science, no. 1, 28pp.
15	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
14	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
14	Webster, R.P. & Edsall, J. 2007. 2005 New Brunswick Rare Butterfly Survey. Environmental Trust Fund, unpublished report, 232 recs.
14	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
13	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
13	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
13	Wissink, R. 2000. Rare Plants of Fundy: maps. Parks Canada, 20 recs.
12	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
12	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
12	Morton, L.D. & Savoie, M. 1983. The Mammals of Kouchibouguac National Park. Parks Canada Report prep. by Canadian Wildlife Service, Sackville, NB, Vols 1-4. 14 recs.
11	Bredin, K.A. 2001. WTF Project: Freshwater Mussel Fieldwork in Freshwater Species data. Atlantic Canada Conservation Data Centere, 101 recs.
11	Mazerolle, M.J., Drolet, B., & Desrochers, A. 2001. Small Mammal Responses to Peat Mining of Southeastern Canadian Bogs. Can. J. Zool., 79:296-302. 21 recs.
10	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
10	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (Pseudevernia cladonia). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
10	Tremblay, E. 2001. Kouchibouguacis River Freshwater Mussel Data. Parks Canada, Kouchibouguac NP, 45 recs.
9	Amirault, D.L. 2000. Piping Plover Surveys, 1983-2000. Canadian Wildlife Service, Sackville, unpublished data. 70 recs.
9	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2000.
9	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
9	Broders, H.G. & Forbes, G.J. 2000. Chiropteran Species Diversity at Kouchibouguac National Park NB, as determined by echolocation surveys. University New Brunswick Paper, 11 recs.
9	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
8	Bryson, I. 2013. Nova Scotia rare plant records. CBCL Ltd., 180 records.
8	Hinds, H.R. 1992. Rare Vascular Plants of Fundy National Park. , 10 recs.
8	Hinds, H.R. 1997. Vascular Plants of Cocagne Island. , 14 recs.
8	Webster, R.P. 2006. Survey for Suitable Salt Marshes for the Maritime Ringlet, New Populations of the Cobblestone Tiger Beetle, & New Localities of Three Rare Butterfly Species. New Brunswick WTF Report, 28 recs.
7	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
6	Cronin, P. & Ayer, C.; Dubee, B.; Hooper, W.C.; LeBlanc, E.; Madden, A.; Pettigrew, T.; Seymour, P. 1998. Fish Species Management Plans (draft). NB DNRE Internal Report. Fredericton, 164pp.
6	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
6	Godbout, V. 2002. SAR Inventory: Birds in Fort Beauséjour NHS. Parks Canada, Atlantic, SARINV02-01. 202 recs.
6	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2010. New Brunswick Dept Natural Resources, 16 recs (11 active).
6	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
6	Newell, R.E. 2008. Vascular Plants of Muzroll Lake. Pers. comm. to C.S. Blaney, 1 pg. 43 recs.
6	Sabine, D.L. 2013. Dwaine Sabine butterfly records, 2009 and earlier.
5	Houston, J.J. 1990. Status of the Redbreast Sunfish (Lepomis auritus) in Canada. Can. Field-Nat., 104:64-68. 15 recs.
5	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
5	Litvak, M.K. 2001. Shortnose Sturgeon records in four NB rivers. UNB Saint John NB. Pers. comm. to K. Bredin, 6 recs.
5	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
4	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
4	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
4	Dept of Fisheries & Oceans. 1999. Status of Wild Striped Bass, & Interaction between Wild & Cultured Striped Bass in the Maritime Provinces. , Science Stock Status Report D3-22. 13 recs.
4	Doucet, D.A. 2008. Wood Turtle Records 2002-07. Pers. comm. to S. Gerriets, 7 recs, 7 recs.

# recs	CITATION
4	Goltz, J.P. 2002. Botany Ramblings: 1 July to 30 September, 2002. N.B. Naturalist, 29 (3):84-92. 7 recs.
4	Gowan, S. 1980. The Lichens of Kouchibouguac National Park, Parts I (Macrolichens) & II (Microlichens). National Museum of Natural Sciences. Ottawa, ON, 7 recs.
4	Gravel, Mireille. 2010. Coordonnées des tortues des bois Salmon River Road, 2005. Kouchibouguac National Park, 4 recs.
4	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
4	Mawhinney, K. & Seutin, G. 2001. Lepidoptera Survey of the Salt Marshes of of Kouchibouguac National Park. Parks Canada Unpublished Report, 5p. 9 recs.
3	Bagnell, B.A. 2003. Update to New Brunswick Rare Bryophyte Occurrences. B&B Botanical, Sussex, 5 recs.
3	Canadian Wildlife Service, Atlantic Region. 2010. Piping Plover censuses 2006-09. , 35 recs.
3	Clayden, S.R. 2006. Pseudevernia cladonia records. NB Museum. Pers. comm. to S. Blaney, Dec, 4 recs.
3	Forbes, G. 2001. Bog Lemming, Phalarope records, NB. , Pers. comm. to K.A. Bredin. 6 recs.
3	Gautreau-Daigle, H. 2007. Rare plant records from peatland surveys. Coastal Zones Research Institute, Shippagan NB. Pers. comm. to D.M. Mazerolle, 39 recs.
3	Gauvin, J.M. 1979. Etude de la vegetation des marais sales du parc national Kouchibouguac, N-B. M.Sc. Thesis, Universite de Moncton, 248 pp.
3	Grondin, P. & Blouin, J-L., Bouchard, D.; et al. 1981. Description et cartographie de la vegetation du cordon littoral. Parc National de Kouchibouguac. Le Groupe Dryade, 57 pp.
3	Lautenschlager, R.A. 2005. Survey for Species at Risk on the Canadian Forest Service's Acadia Research Forest near Fredericton, New Brunswick. Atlantic Canada Conservation Data Centre, 6. 3 recs.
3	Marshall, L. 1998. Atlantic Salmon: Southwest New Brunswick outer-Fundy SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-13. 6 recs.
3	Nye, T. 2002. Wood Turtle observations in Westmorland, Queens Cos. , Pers. com. to S.H. Gerriets, Dec. 3. 3 recs.
3	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
3	Popma, K. 2001. Phalarope & other bird observations in Westmorland Co. , Pers. comm. to K.A. Bredin. 5 recs.
3	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
3	Webster, R.P. 2004. Lepidopteran Records for National Wildlife Areas in New Brunswick. Webster, 1101 recs.
3	Webster, R.P. 2005. Coleoptera Data 2004-05. Pers. comm. to D. Doucet. 16 recs, 16 recs.
2	Boyne, A.W. 2000. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 168 recs.
2	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 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	Donelle, R. 2007. Bouctouche Dune Rare Coastal Plant Data. Irving Eco-centre, la Dune du Bouctouche, 2 recs.
2	Edsall, J. 1992. Summer 1992 Report. New Brunswick Bird Info Line, 2 recs.
2	Edsall, J. 1993. Spring 1993 Report. New Brunswick Bird Info Line, 3 recs.
2	Godbout, V. 2001. Recherche de l'Aster du St-Laurent (Symphyotrichum laurentianum) dans les marais sales du sud-est du Nouveau-Brunswick. Irving Eco-centre, la Dune du Bouctouche, 23 pp.
2	Hicklin, P.W. 1995. The Maritime Shorebird Survey Newsletter. Calidris, No. 3. 6 recs.
2	Madden, A. 1998. Wood Turtle records in northern NB. New Brunswick Dept of Natural Resources & Energy, Campbellton, Pers. comm. to S.H. Gerriets. 16 recs.
2	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
2	Sabine, D.L. 2012. Bronze Copper records, 2003-06. New Brunswick Dept of Natural Resources, 5 recs.
2	Sollows, M.C,. 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
1	
1	Amiro, Peter G. 1998. Atlantic Salmon: Inner Bay of Fundy SFA 22 & part of SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-12. 4 recs.
1	Arsenault, G. & Martin, G. 1998. Eco-Centre La Dune de Bouctouche Annual Report. , 2 recs.
1	Benjamin, L.K. (compiler). 2002. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 32 spp, 683 recs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Bishop, G. 2012. Field data from September 2012 Anticosti Aster collection trip. , 135 rec.
1	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
1	Blaney, C.S. 2014. 2014 Bank Swallow colony observation, Westcock, NB. Atlantic Canada Conservation Data Centre.
1	Bouchard, A. Herbier Marie-Victorin, Universite de Montreal, Montreal QC. 1999.
1	Bredin, K.A. 2000. NB & NS Bog Project, fieldwork. Atlantic Canada Conservation Data Centre, Sackville, 1 rec.
1	Bredin, K.A. 2001. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 16 recs.
1	Bredin, K.A. 2002. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 30 recs.
1	Cameron, R.P. 2009. Enioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
1	Chaput, G. 1999. Atlantic Salmon: Miramichi & SFA 16 Rivers. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-05. 6 recs.
1	Clavette, A., and others. 2013. Peregrine Falcon nesting information from NatureNB listserv. NatureNB.
1	Doucet, D.A. 2007. Fieldwork 2007: Insects (minus Odonata). ACCDC Staff, 1 rec.
1	Edsall, J. 1993. Summer 1993 Report. New Brunswick Bird Info Line, 2 recs.
1	Edsall, J. 2007. Lepidopteran Records from Halls Creek, 1994-2000. Edsall, 43 recs.
1	Gerriets, S.H. 1997-2001. Element Occurrence Database. Atlantic Canada Conservation Data Centre, Sackville NB, 1 rec.
1	Godbout, V. 2000. Recherche de l'Aster du St-Laurent (Aster laurentianus) et du Satyre des Maritimes (Coenonympha nepisiquit) au Parc national Kouchibouguac et a Dune du Bouctouche, N-B. Irving Eco-centre, 23 pp.
1	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
1	Goltz, J.P. 2001. Botany Ramblings April 29-June 30, 2001. N.B. Naturalist, 28 (2): 51-2. 8 recs.
1	Goltz, J.P. 2007. Field Notes: Listera australis at Kouchibouguac National Park. , 7 recs.
1	Hinds, H.R. 2000. Rare plants of Fundy in Rare Plants of Fundy: maps. Wissink, R. (ed.) Parks Canada, 2 recs.
1	Holder, M. & Kingsley, A.L. 2000. Peatland Insects in NB & NS: Results of surveys in 10 bogs during summer 2000. Atlantic Canada Conservation Data Centre, Sackville, 118 recs.
1	Jessop, B. 2004. Acipenser oxyrinchus locations. Dept of Fisheries & Oceans, Atlantic Region, Pers. comm. to K. Bredin. 1 rec.

# recs	CITATION
1	Kirkland, G.L. Jr. & Schmidt, D.F. 1982. Abundance, habitat, reproduction & morphology of forest-dwelling small mammals of NS & south-eastern NB. Can. Field-Nat., 96(2): 156-162. 1 rec.
1	Kirkland, G.L. Jr., Schmidt, D.F. & Kirkland, C.J. 1979. First record of the long-tailed shrew (Sorex dispar) in New Brunswick. Can. Field-Nat., 93: 195-198. 1 rec.
1	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
1	LaFlamme, C. 2008. Disovery of Goodyera pubescens at Springdale, NB. Amec Earth and Environmental. Pers. comm. to D.M. Mazerolle, 1 rec.
1	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
1	Loo, J. & MacDougall, A. 1994. GAP analysis: Summary Report. Fundy Model Forest, 2 recs.
1	MacKinnon, D.S. 2013. Email report of Peregrine Falcon nest E of St. Martins NB. NS Department of Environment and Labour, 1 record.
1	MacQuarrie, K. 1991-1999. Site survey files, maps. Island Nature Trust, Charlottetown PE, 60 recs.
1	McAlpine, D.F. & Collingwood, L. 1989. Rare Salamander Survey in Fundy National Park. Fundy National Park, Internal Documents, 1 rec.
1	McAlpine, D.F. & Cox, S.L., McCabe, D.A., Schnare, J.-L. 2004. Occurrence of the Long-tailed Shrew (Sorex dispar) in the Nerepis Hills NB. Northeastern Naturalist, vol 11 (4) 383-386. 1 rec.
1	McAlpine, D.F. 1983. Species Record Cards. Fundy National Park, Library, 1 rec.
1	McAlpine, D.F. 2001. Lepomis auritus, 2 sites in Saint John County. New Brunswick Museum, Pers. comm. to K.A. Bredin. 2 recs.
1	Miller, D.G. 2013. Peregrine Falcon nesting information from birdingnewbrunswick.ca. birdingnewbrunswick.ca.
1	Morrison, Annie. 2010. NCC Properties Fieldwork: June-August 2010. Nature Conservancy Canada, 508 recs.
1	Neily, T.M. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
1	Poirier, Nelson. 2012. Geranium robertianum record for NB. Pers. comm. to S. Blaney, Sep. 6, 1 rec.
1	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
1	Sabine, D.L. & Goltz, J.P. 2006. Discovery of Utricularia resupinata at Little Otter Lake, CFB Gagetown. Pers. comm. to D.M. Mazerolle, 1 rec.
1	Sabine, D.L. 2004. Specimen data: Whittaker Lake & Marysville NB. Pers. comm. to C.S. Blaney, 2pp, 4 recs.
1	Saunders, J. 2009. White-Fringe Orchis photo and coordinates. Pers. comm. to S. Blaney, July 17. 1 rec, 1 rec.
1	Smith, M. 2013. Email to Sean Blaney regarding Schizaea pusilla at Caribou Plain Bog, Fundy NP. pers. comm., 1 rec.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.
1	Steeves, R. 2004. Goodyera pubescens occurrence from Colpitts Brook, Albert Co., Pers. comm. to C.S. Blaney. 1 rec.
1	Toner, M. 2005. Listera australis population at Bull Pasture Plains. NB Dept of Natural Resources. Pers. comm. to S. Blaney, 8 recs.
1	Toner, M. 2005. Lynx Records 1996-2005. NB Dept of Natural Resources, 48 recs.
1	Toner, M. 2009. Wood Turtle Sightings. NB Dept of Natural Resources. Pers. comm. to S. Gerriets, Jul 13 & Sep 2, 2 recs.
1	Tremblay, E., Craik, S.R., Titman, R.D., Rousseau, A. & Richardson, M.J. 2006. First Report of Black Terns Breeding on a Coastal Barrier Island. Wilson Journal of Ornithology, 118(1):104-106. 1 rec.
1	Wissink, R. 2000. Four-toed Salamander Survey results, 2000. Fundy National Park, Internal Documents, 1 rec.
1	Young, A.D., Titman, R.D. 1986. Costs and benefits to Red-breasted Mergansers nesting in tern and gull colonies. Can. J. Zool., 64: 2339-2343.