ENVIRONMENTAL ASSESSMENT REGISTRATION

TRACADIE WASTEWATER TREATMENT PLANT UPGRADES

REGIONAL MUNICIPALITY OF TRACADIE

Our File No.: 47-17-C

April 2017

Prepared for:

Municipalité régionale de Tracadie

Prepared by:

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ACRONYMS

ACCDC – Atlantic Canada Conservation Data Centre
ASU – Archeological Services Unit
CCME – Canadian Council of Ministers of the Environment
CEAA – Canadian Environmental Assessment Agency
CEAA 2012 – Canadian Environmental Assessment Act (2012)
COPC – Chemicals of Potential Concern
CoA – Certificate of Approval
CoD – Certificate of Determination
COSEWIC – Committee on the Status of Endangered Wildlife in Canada
CSA – Canadian Standards Association
DELG – NB Department of Environment and Local Government
DPS – NB Department of Public Safety
DTI – NB Department of Transportation and Infrastructure
DFO – Department of Fisheries and Oceans Canada
EIA – Environmental Impact Assessment
ESA – Environmentally Significant Area
EMP – Environmental Management Plan
GPS – Global Positioning System
HDPE – High Density Polyethylene
IBA – Important Bird Areas
LAT – Latitude
LIDAR – Light Detection and Ranging
LONG – Longitude
MBBA – Maritime Breeding Bird Atlas
MBCA – Migratory Birds Convention Act
OWLS – Online Well Log System
PID – Real Property Parcel Identification Number
PDA – Project Development Area
ROW – Right-Of-Way
SAR – Species at Risk
SARA – Species at Risk Act
SOCC – Species of Conservation Concern
TC – Transport Canada
TRC – Technical Review Committee
VEC – Valued Environmental Component

EXECUTIVE SUMMARY

The Tracadie Regional Municipality operates a wastewater treatment plant, consisting of a 2-pond, multi-cell facultative lagoon, associated aeration system, infrastructure and outfall. The current system, built in 1984, has a leak (or leaks) in the clay liner, is no longer adequate to meet the effluent quality requirements of the current operating approval, and will be nearing its end-of-life period within the next 10 years. The Regional Municipality of Tracadie is therefore proposing to upgrade the lagoon, including expanding its capacity and upgrading its aeration system. Under Schedule A, item (n), of the NB *Environmental Impact Assessment Regulation*, "all sewage disposal or sewage treatment facilities, other than domestic, on-site facilities" and their significant modifications require registration.

The proposed project will be initiated in 2017, and is anticipated to be completed by March 30th, 2018. The project will take place within the existing wastewater treatment plant footprint and will result in improved effluent quality and increased capacity for the wastewater treatment plant, without expanding the overall facility footprint.

Based on the assessment of the project's potential impacts, the existing site characteristics, the positive impacts of the project and the recommended mitigation, no significant adverse environmental effects are anticipated from the development of this project.

1. THE PROPONENT

1.1 NAME OF PROPONENT

The proponent is the Regional Municipality of Tracadie /Municipalité régionale de Tracadie.

1.2 ADDRESS OF PROPONENT

Municipalité régionale de Tracadie
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1.3 CHIEF EXECUTIVE OFFICER

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1.4 PRINCIPAL CONTACT PERSONS FOR THE PURPOSES OF THE ENVIRONMENTAL IMPACT ASSESSMENT

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1.5 PROPERTY OWNERSHIP

The project will be located on property owned by the Regional Municipality of Tracadie.

2. THE UNDERTAKING

2.1 NAME OF THE UNDERTAKING

The name of the Undertaking is *Tracadie Wastewater Treatment Plant Lagoon Upgrades*.

2.2 BACKGROUND

The Tracadie Regional Municipality is located on the eastern shore of the Acadian Peninsula in Gloucester County, New Brunswick. The Municipality is the amalgamation of the Town of Tracadie and the Village of Sheila, which became Tracadie-Sheila in 1992 and has a population of 3,184 (2016 Canada Census).

The municipality currently operates separate Tracadie and Sheila wastewater treatment lagoons, with the Tracadie lagoon serving Tracadie and its outlying areas, and a population of approximately 3180 clients. With the recent addition of the neighbourhoods of St.-Isidore and Pont Landry, the system may soon reach its maximum treatment capacity. Although there remains approximately 5% percent for additional growth, the Municipality is now proposing to pro-actively expand its treatment plant capacity.

Photo No. 1: Existing Tracadie Lagoon (December, 2016)

2.3 PROJECT OVERVIEW

The Regional Municipality of Tracadie ("Tracadie") is proposing to upgrade its current wastewater treatment plant (WWTP) to increase its capacity and improve the quality of the effluent discharging to the Tracadie River and estuary.

The overall project will be undertaken in multiple phases, based on funding availability and construction season/scheduling. Phase 1 will be the subject of this registration document and includes the following components:

- Lagoon – includes raising Existing East Pond berms, increasing the depth of Proposed Pond #2 (1.2m to 4,5m); installation of a High Density Poly Ethylene (HDPE) liner to replace the existing clay liner which is leaking considerably; stabilizing berms (native vegetation); maintaining an access road on berms; installation of security fence and surface water management perimeter system, where necessary;
- Aeration system: includes upgrading the aeration system using new and refurbished parts; air header supply line; air laterals with ballasts; air diffusers/aerators; and new membranes.
- Baffles installation: Installation of new baffle curtains;
- Piping and Controls: Installation and commissioning of infrastructure and system controls;
- Blower Building: The current blower building is not adequate and will be replaced with a new building ~8m x 12m in size;
- Ultraviolet (UV) Treatment System: Installation of a new UV system, equipment, valves, and flow meter, and
- Bird watching Platforms: Two (2) existing bird watching blinds will be repaired and/or replaced, depending on condition after completion of the project.

The proposed upgrades will be located within the footprint of the current WWTP – thereby minimizing the potential adverse impacts on the surrounding environment. These project components will significantly improve the quality of effluent at current volumes, and increase the overall capacity of the plant for future expansion of the system.

Future phases of the project will include:

- Outfall improvements: Physical works to improve near-field mixing, such as adding a diffuser and re-locating and stabilizing the outfall pipe;
- Installation of sanitary sewage pipe to accept waste from the Sheila sector;
- Decommissioning the existing Sheila WWTP and removing outfall pipe, and
- Accepting and treating waste from other nearby areas.

Given the timing constraints related to the funding of this project, a request has been made to the Department of Environment and Local Government to defer the review of the existing outfall pipe (along with the details of any actual relocation of the pipe or installation of a diffuser) to a later date.

It is our understanding that the Department of Environment and Local Government has accepted this process but will most likely impose conditions to only allow increase in influent into the lagoon once the outfall issues have been resolved and any required construction activities completed.

The Regional Municipality of Tracadie understands that this approach may result in Conditions of Determination, and may require additional assessment and work on the outfall location.

A preliminary impact assessment of the lagoon design flows on the Little Tracadie River does not meet the following condition:
A mixing zone should not occupy more than 25% of the cross-sectional area or volume of flow of a receiving watercourse, during 7 day - 10 year low flow conditions (Schedule B of Regulation 2002-13 under the NB Clean Water Act).

Further evaluation of this condition and potential options will require field work and modeling to find an appropriate solution. This work can only start when the river is cleared of ice and is planned to be completed before the end of the year. A proposed solution is planned to be submitted to the Department of Environment and Local Government for review and comments.

Photo No. 2: Existing Tracadie Lagoon (December, 2016)

2.4 PURPOSE/RATIONALE/NEED FOR THE UNDERTAKING

The Regional Municipality of Tracadie currently operates a municipal WWTP which was constructed in the early 1980's and consisted of two (2) stabilization ponds 1.2m deep. In 1996, the Town upgraded these by adding a fine bubble aeration system, combined with curtains to create five (5) cells.

Tracadie has identified deficiencies in its current system, namely the quality of the effluent (bacteria) and a leaking clay liner; however, the addition of the St.-Isidore and Pont Landry areas have also alerted the

municipality to the potential limits of capacity of the lagoon, to adequately treat additional wastewater from future development or the extension of services to additional areas.

The sewer flows for the proposed project (with an average of 75% infiltration) are, at present, 2,960m^3/day for 3,180 system clients (this includes an estimated 25% connection in Pont Landry). The remaining clients in Pont Landry and the addition of St-Isidore, (which is in the process of being completed), will increase the flow to 3,310m^3 per day for 3,770 clients (considering a 30% infiltration for the new system). In the future, it is anticipated that the Sheila sector will be connected (4,380m^3/day for 4,490 clients total), and a 1% annual population growth is anticipated over the 25-year anticipated lifespan of the lagoon, resulting in 5,610 m^3/day for 6,390 clients (refer to Table 1 below).

Table 1: Current and Projected Users and Design Flows (Dry Conditions, 30% Infiltration)

	Scenario	Population	Sewer Flows (m^3)
1	Present Conditions	3,180	2,960
2	Pond Landry and St. Isidore 100% connected	3,770	3,310
3	Sheila Sector connected	4,490	4,380
4	1% growth over 25 years	6,390	5,610

The existing lagoon has the capacity to treat the present-condition flows and will be able to treat the flows from St-Isidore and Pont Landry when all potential users are connected (scenario 2 above). With a BOD_5 influent concentration of 220mg/l for this 5-cell aerated lagoon, we estimate that 30-day retention is required to safely reduce the effluent BOD level to less than 25mg/l, as required. Considering the estimated flow for Present Conditions, including potential flows from St-Isidore and Pont-Landry, the retention time would be 31.7days. We estimate the existing lagoon could also treat an extra flow of 120m^3/day or an equivalent of 350 individuals. The lagoon retention time would then be 30.2 days.

The WWTP design will be engineered to have additional capacity in the event of future expansions of the collection system.

The proposed lagoon upgrades will improve the effluent quality (and therefore the water quality in the Tracadie River and estuary), as well as eliminate potential groundwater impacts near the lagoon, and extend the life of the facility beyond the year 2043.

2.5 PROJECT LOCATION

The proposed project will be at the location of the current WWTP lagoon. The WWTP is located at civic address 3374 rue des canards, east of the Little Tracadie River. The property, Service New Brunswick PID no. 20701306, is owned by the municipality (refer to project location figure 1.0).

The parcel is located within the municipal planning area, and is zoned appropriately for the intended use.

The center of the proposed disposal site is geo-referenced at LAT 46^O, 08', 26.96" N, LONG 65^O, 52', 18.74" W.

Figure 1: Project Location

The subject property parcel is approximately 25 hectares in size, and located on the peninsula formed by the Little Tracadie River and Tracadie Bay. The property is bordered to the north by rue de la Block, and a regulated wetland immediately north of this street. The eastern property boundary borders on a wooded private lot, and beyond which is Tracadie Bay. To the south, a wooded lot separates the parcel from a private residential lot, as well as a collection of cottages and spa (Deux Rivières Resort). To the west, there are a number of residences along rue de la Chappelle, separated from the lagoon by a forested buffer. Two (2) Provincially Significant Wetlands are located to the east along the edge of the estuary, but are outside the project footprint and are not anticipated to be impacted by the project.

2.6 SITING CONSIDERATIONS

The project site was chosen for a variety of favourable elements:

a. The parcel is owned by the proponent;
b. The project site is the current WWTP location;
c. The proposed site will use the existing infrastructure in place;
d. The project site is in an area with limited residential development, thereby avoiding conflicts due to odours, etc.;
e. The site is outside of any municipal water supplies;
f. There are no down-gradient domestic wells in the vicinity of the site;
g. The land is properly zoned for a WWTP;
h. Site access and security is already established;

i. Upgrading the existing plant is cost-effective, and
j. This will avoid or significantly minimize potential adverse environmental impacts by *not* requiring the development of a new site.

2.7 PHYSICAL COMPONENTS AND DIMENSIONS OF THE UNDERTAKING

The current WWTP contains a 2-pond lagoon- Existing East Pond and Existing West Pond - with each consisting of various cells representing different treatment types (refer to Figure 2).

The Project Development Area (PDA) consists of the existing WWTP footprint.

The proposed, upgraded system will have the same secondary treatment processes as the current system, but with expanded capacity and the addition of UV treatment prior to discharge. The project consists of a full reconstruction of the current system, and will include the following components:

- Two new ponds: The total volume of the proposed WWTP will be 180,000 m3 compared to the current 130,000 m3. However, the new system will use only half of the existing surface, but will have 4.5m of water depth, rather than the current 1.2m.

- HDPE liner: The ponds will be lined with a new HDPE membrane, installed by a certified contractor, to replace the existing clay liner which is believed to be leaking.

- Baffle curtains: Each proposed pond will receive new synthetic baffle curtains to create 4 cells.

- New aeration system: the existing diffuser units are in good condition and will be reused, but new membranes will be installed and supplemented with new units to complete the aeration system upgrade.

- New control structures and piping: The control structures and piping system will be set to allow the ponds to work in series, but also in parallel in each pond if necessary. This contingency feature will allow the operator to complete maintenance or repairs in one of the ponds, while continuing treatment in the other pond, if necessary.

- Blower building: A new blower building will be constructed and house four (4) new blowers and a new UV treatment system.

  The current blower building is undersized for the proposed WWTP upgrades, therefore a new building will be constructed adjacent to the current building, approximately 8x12m in size. Once the new blower building and equipment has been completed and commissioned, the current blower building will be demolished. New infrastructure and system controls will be installed in the new blower building, as well as the installation of a new in-line UV system, for bacteria treatment prior to effluent discharge. The existing chlorination building will be demolished.

In addition to the above treatment components, the following additional works will be completed as part of the overall project:

- Bird watching blinds: There are two (2) existing bird watching blinds/platforms located near the lagoon for local birdwatchers to observe and photograph birds, particularly migrating waterfowl

in the fall. These will be kept but may need to be moved to accommodate construction. If necessary, they will be repaired or rebuilt, depending on condition.

- The perimeter security fence and surface water management system (perimeter ditches) will also be retained where possible, and re-established where necessary.

Refer to Appendix A for detailed diagrams of the project components.

Photo No. 3: Security Gate, Bird Watching Platform and Blower Building (December, 2016)

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scale/echelle: 1:4000	date: FÉVRIER 2017	drawn by/dessine par: R. THIBODEAU	No.: 047—17—SK1
			rev.: A

Photo No. 4: Chlorine Building (December, 2016)

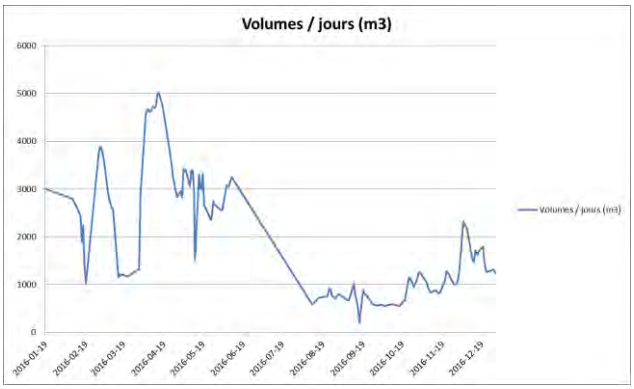
2.8 CONSTRUCTION, OPERATION AND MAINTENANCE DETAILS

The overall construction strategy requires that the WWTP be upgraded while the existing system continues to operate. In order to achieve this, the following construction sequence is proposed:

2.8.1 Construction Sequence

The proposed wastewater treatment system must be constructed while the existing treatment system is in operation. In order to achieve this, the following strategy is proposed:

- Main construction activities will take place during low flow conditions, from July to November;



- Construct two (2) new ponds within the Existing East Pond; no work will be done outside the existing east and south berms' top, outer edges;
- Excavate the Existing East Pond bottom by 1.2m; this material will be used to augment the berms and minimize the requirement to import material;
- The new berms' outer slopes will be re-vegetated immediately after they are completed;
- Continue treating wastewater in the Existing West Pond while construction occurs in the East Pond (Proposed Pond #2);
- Increase the height of the Existing West Pond by 0.6m in order to increase the retention time and treatment capacity;
- Monitor BOD, TSS and coliform twice daily when draining the ponds to the outfall pipe and stop discharging before the parameters exceed allowable concentrations. The discharge rate will be selected to drain approximately 1/3 for wastewater volume within 3 days. The rest will be pumped into the Existing West Pond for treatment;, and
- Construct ponds for sludge disposal within the existing ponds and implement odour mitigation measures as per section 4.6.

The following describes the construction schedule, in order of occurrence and corresponding duration. Please refer to Appendix A for detailed diagrams showing each of the construction activities.

2.8.2 Construction Schedule

The proposed start date of construction is July 3rd, 2017.

2.8.2.1 Site Preparation (1 week) (Refer to step **1** on attached sketch "47-17-ENV-SK2)

a. Installation of site trailer and equipment mobilization;
b. Prepare site stockpile and material laydown area,
c. Install sediment control structure and silt fence.

2.8.2.2 Temporary Modifications – West Pond to Isolate East Pond (2 weeks) (Step **2,** "47-17-ENV-SK2)

a. Install temporary air header and put in operation;
b. Install temporary outlet pipe (c\w temporary plug);
c. Install temporary intermediate pipe;

d. Raise existing berms;
e. Install temporary silt curtain
f. Partial construction of new west berm to match raised existing berms, put temporary intermediate pipe in operation (item 1-c) and remove existing intermediate pipe and structure, and
g. Construct sludge pond # 1.

2.8.2.3 East Pond – Preparation (2 weeks) (Step **3** on sketch "47-17-ENV-SK2)

a. Put temporary outlet (item 1-b) pipe in operation drain East Existing Pond and raise water level in West Existing Pond of 0.6 m;
b. Remove existing aeration system in Existing East Pond;
c. Move sludge in Existing East Basin into sludge pond #1 and remove vegetation from existing berms, and
d. Remove outlet pipe and control structure.

2.8.2.4 Construction of New Pond #1 and Pond #2 (9 weeks) (Step **4** on sketch "47-17-ENV-SK2)

a. Construct new berms as well as install force mains, lagoon piping and control structures;
b. Sub-drainage piping;
c. Install liner complete with protection layer and geotextile, and
d. Install top soil and hydro-seed.

2.8.2.5 Construction of Blower and UV Building (16 weeks) (Step 5 on sketch "47-17-ENV-SK2)

a. Construct new site entrance;
b. Building construction, and
c. Blower and UV systems delivery delay and installation.

2.8.2.6 Installation of Aeration System and Curtains (2 weeks) (Step **6** on sketch "47-17-ENV-SK2)

a. Install air header piping system and complete berm top structure;
b. Install diffuser lateral piping in both Proposed Pond #1 and Pond #2;
c. Install existing diffusers salvaged c/w new membrane in Proposed Pond #2, and
d. Install new curtains.

2.8.2.7 Preparation of New Lagoon for Commissioning (2 weeks) (Step **7** on sketch "47-17-ENV-SK2)

a. Install new fence and gate;
b. Transfer part of diffusers complete with new membrane from Existing West Pond into New Pond #2;
c. Put new force mains in operation and direct sewerage into Pond #2;
d. Discharge part of treated wastewater of Existing West Pond to River (approximately 1/3 of total volume if effluent meets discharge regulations);
e. Transfer the rest of diffusers complete with new membranes in to New Pond #1, and
f. Transfer the rest of the wastewater from Existing West Pond into New Pond #1.

2.8.2.8 Commissioning New Lagoon (2 weeks) and Demolition of Existing/Unused Infrastructure (4 weeks) (Step **8** on sketch "47-17-ENV-SK2)

a. Perform new lagoon commissioning;
b. Drain the rest of the Existing West Pond wastewater into New Pond #1 if any;
c. Remove temporary air piping, temporary outlet piping and existing diffuser laterals;
d. Construct sludge pond # 2;
e. Move sludge to sludge pond # 2;
f. Complete West berm slope and cap sludge ponds with wood chip;
g. Install remaining top soil and hydro-seeding on berms slopes;
h. Create swales in the bottom of the Existing West Pond, install draining structure;
i. Salvage existing blower building and equipment;
j. Demolish existing blower building floor and foundation;
k. Demolish abandoned chlorination building;
l. Remove existing inlet pipe and structure, and
m. Repair disturbed areas and clean site.

2.9 REGULATORY APPROVALS

The Province of New Brunswick's Department of Environment and Local Government (DELG) regulates the siting, construction, operation, maintenance and decommissioning of wastewater treatment facilities in New Brunswick under the Clean Environment Act and the Clean Water Act.

Wastewater management is regulated by the Department of Environment and Local Government through the facility's certificate of Approval to Construct and Operate, issued under the NB *Water Quality Regulation*. Section 3(4) of the Regulation states:

No person shall, without an approval, which approval must include approval of the discharge point, construct, modify or operate or permit the construction, modification or operation of any wastewater works.

Section 3(7) states:

No person shall construct, modify or operate or permit the construction, modification or operation of any source, wastewater works or waterworks except in accordance with the terms and conditions of the approval issued for such source, wastewater works or waterworks.

An application for an Approval to Construct and Operate for the proposed project shall be submitted to the Department of Environment and Local Government in conjunction with this EIA registration.

Refer to Appendix D for Tracadie's current Approval to Operate.

Phase 1 of the project is not anticipated to require federal authorization; however, where necessary, applicable federal legislation will be addressed in future project phases.

3. DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 PHYSICAL AND NATURAL FEATURES

General

The project property is a parcel of land containing the current Tracadie WWTP, located on Pointe à Chaudron, a peninsula formed between the Little Tracadie River and the Tracadie Bay. The WWTP site is gated and contains a perimeter security fence, and is further surrounded by a mature, mixed-wood treed buffer. The site consists of an access road (rue des Canards), a blower building, and two facultative lagoons currently operating. Refer to Appendix B for aerial photos of the site.

Geology

Based on the Geological Survey of Canada's Surficial Geology Map of New Brunswick (Rampton, 1984), the surficial geology of the subject area consists of Late Wisconsinan- and/or Early Holocene-aged marine sediments deposited as blankets and plains consisting of sand, silt, minor clay and gravel, patchy thin veneer of organic sediment; generally 0.5 to 3 m thick.

Based on the Department of Natural Resources Geological Map of New Brunswick (2008), the regional bedrock geology of the subject area is identified as Late Carboniferous-aged sedimentary rocks.

Overburden materials are generally gravelly or silty sands, with bedrock identified as brown mudstone and sandstone.

Topography

The Service New Brunswick (SNB) LIDAR data was consulted for the project site. The area in question is, in general terms, flat, with land gently sloping towards the Little Tracadie River to the west, and the Tracadie Bay to the south and east. Surface water in the area typically flows in these directions, via roadside drainage ditches or over land.

Surface Water

According to GeoNB Map Viewer, there are no regulated wetlands within the proposed project footprint. There are three (3) Provincially Significant Wetlands (PSW), approximately 85m, 90m, and 290m east of the project footprint. These are coastal saltwater marshes located along the shore of Tracadie Bay. An additional PSW saltwater marsh is located approximately 500m to the south of the project site. A peat bog is also located approximately 130m north of the site, across rue de la Block.

No watercourses are located within the subject property. The nearest watercourse is the Little Tracadie River, a tidal river located approximately 300m west of the subject site. To the south and east is Tracadie Bay, a shallow bay protected from the Bay de Chaleur by narrow beach/sand dune complexes.

The Little Tracadie River is a tidally-influenced river with a drainage area (watershed) of approximately 258 km^2 (Natech, 2012). A public dock and boat launch is located near the lagoon outfall, immediately downstream of the Rue Principale bridge. Various private docks are located along the shores of the estuary, Camping le Minique campground is situated upstream of the bridge approximately, and major upriver land uses include agriculture, residential and forestry.

Tracadie Bay covers an area of approximately 3,123 ha, and supports a variety of uses, including fisheries, aquaculture, recreation and habitat for various fish and bird species, including critical nesting habitat for the Piping Plover (*Charadrius melodus melodus*), a Species at Risk.

Groundwater

Residences within Tracadie are mainly connected to the municipal water supply; however, houses near the shore at the end of rue de la Block, an area developed beyond the existing municipal supply system, are on private wells. A search of the Department of Environment and Local Government's Online Well Log System (OWLS) was completed to identify general groundwater conditions in the area. A search radius of 1.5 km was selected and eight (8) well records were returned for water wells drilled between 2001 and 2015. The nearest well is approximately 300m to the northeast of the subject site. All wells are supplied with groundwater from a bedrock aquifer. Refer to Table 1 for well log summary.

The subject site is not located within a municipal Wellfield designated under the Wellfield Protected Area Designation Order (WfPADO) – refer to Appendix F for the Town zoning plan showing these protected areas.

Vegetation

The subject property was previously a forested parcel until the lagoon was built by the Village of Tracadie in 1984. The area surrounding the existing ponds consists of a treed buffer, consisting primarily of mature and mixed-wood tree species including white spruce (*Picea glauca*), black spruce (*Picea mariana*), tamarack (*Laryx laricina*), balsam fir (*Abies balsamea*), white birch (*Betula papyrifera*), red maple (*Acer rubrum*) and trembling aspen (*Populus tremuloides*).

The area immediately surrounding the existing ponds consists of a grassed area maintained by Tracadie.

3.1.1. Wildlife and Wildlife Habitat

The subject site is located in a forested parcel adjacent to an urban area, with residences to the east, west and south. The WWTP is a man-made site and is not considered suitable habitat for larger wildlife, however is likely houses small, common wildlife such as rodents, etc. due to the grass and water adjacent to mature forest. Migratory waterfowl and common amphibian species also take advantage of the lagoon's open water, particularly waterfowl during the fall migration period.

Figure 3: Regulated Wetlands and Watercourses (GeoNB Map Viewer)

Table 2: Results of Well Log Search (1.5 km Radius from Center of Subject Property).

WELL #	DEPTH (m)	Driller's ESTIMATED SAFE YIELD (lgpm)	Depth to Water Bearing Fractures (ft) and Rate (lgpm)	YEAR DRILLED	USE
1	13.72	36.4	8.53 (4.55 lgpm), 10.06 (4.55 lgpm), 11.89 (9.1 lgpm) & 13.41 (18.2 lgpm)	2001	Domestic
2	23.77	36.4	21.34 (31.85 lgpm) & 0.91 (345.8 lgpm)	2009	Domestic
3	32.92	45.5	21.34 (22.75 lgpm), 23.16 (13.65 lgpm) & 31.39 (22.75 lgpm)	2010 (Deepened)	Domestic
4	12.19	36.4	11.28 (45.5 lgpm) &	2007	Domestic

			11.58 (40.95 Igpm)		
5	29.57	59.15	15.85 (18.2 Igpm) & 21.03 (40.95 Igpm)	2007	Domestic
6	22.25	54.6	6.71 (18.2 Igpm) & 19.2 (36.4 Igpm)	2015	Domestic
7	20.42	-	-	2015	Domestic

Photo No. 5: Lagoon Grassed Area (December 2016)

Migratory Birds

According to the Nature NB Environmentally Significant Areas database, the area around and including the project site is known for its abundance and variety of migratory bird species, particularly waterfowl which use the lagoon as a late fall/early winter staging area, prior to migrating south. There are currently two (2) permanent bird watching blinds at the lagoon site for birders to observe and photograph migratory birds (photo no. 6).

A review of the Maritime Breeding Bird Atlas (MBBA) online tool identified 163 migratory bird species for the area (atlas square 20LT58), including waterfowl, shorebird, birds-of-prey, and thirteen (13) species of conservation concern. Refer to section 3.1.1.2 for additional information on the Species at Risk.

In addition to the MBBA, the Commission de l'environnement de Tracadie (CET), a local environmental stewardship group, was consulted for additional information on bird use of the lagoon. Joannie Thériault, the CET coordinator, provided a list of species which were observed during the year 2014 at the lagoon. Of the 36 bird species confirmed in the lagoon, 12 species are considered Species of Conservation Concern (SOCC). Refer to Appendix C.2 for the complete list of birds observed.

The Regional Municipality of Tracadie recognizes that migratory birds will be in important consideration in completing the proposed project. Environment Canada regulates the protection of migratory birds through the Migratory Birds Convention Act (MBCA), which protects migratory birds, their eggs, nests, and their young through the *Migratory Birds Regulations* (MBR).

Photo No. 6. Bird Watching Blind (left) Located beside Blower Building

"Under Section 6 of the *Migratory Birds Regulations* (MBR), no person shall disturb, destroy or take a nest or egg of a migratory bird; or to be in possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit. It is important to note that under the current MBR, no permits can be issued for the incidental take of migratory birds caused by development projects or other economic activities. Furthermore, Section 5.1 of the MBCA describes prohibitions related to deposit of substances harmful to migratory birds:

Migratory birds protected by the MBCA include all seabirds except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles). Most of these birds are specifically named in the Environment Canada publication, *Birds Protected in Canada under the Migratory Birds Convention Act*, Canadian Wildlife Service Occasional Paper No. 1.

"5.1 (1) No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area.

(2) No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance — in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area — that is harmful to migratory birds."

The Regional Municipality of Tracadie recognizes that it is the responsibility of the proponent to ensure that activities comply with the MBCA and regulations.

Species at Risk

Canada's Species at Risk Act (SARA) is one of three major components in the Government of Canada Strategy for the Protection of Species at Risk. It is designed as a key tool for the conservation and protection of Canada's biological diversity and fulfils an important commitment under the United Nations Convention on Biological Diversity. New Brunswick also has a Species at Risk Act which complements the federal Act.

The purpose of **SARA** is to:

A. Prevent wildlife species from becoming extinct or extirpated (lost from the wild in Canada);
B. Help in the recovery of extirpated, endangered or threatened species; and
C. Ensure that species of special concern do not become endangered or threatened.

Information was requested from the Atlantic Canada Data Conservation Centre (ACCDC) for observations of rare and/or endangered wildlife species within a 5km radius of the subject site (tables 3, 4 and 5). The Maritime Breeding Bird Atlas was also consulted to identify confirmed or probable SAR breeding species within the Acadian Peninsula atlas square 20LT58. Refer to table 2 for S-Rank Definitions.

A review of each species' habitat requirements was completed, and compared with observations obtained during site visits. A summary of this analysis is presented in section 4.

Table 3: ACCDC S-rank and Rarity Definitions

Atlantic Canada Conservation Data Centre (ACCDC) S-Rank **www.accdc.com/en/rank-definitions.html**	
S-RANK DEFINITIONS	
SX	**Presumed Extirpated**: Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate

	habitat, and virtually no likelihood that it will be rediscovered.
S1	**Critically Imperiled** - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2	**Imperiled** - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3	**Vulnerable** - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	**Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	**Secure** - Common, widespread, and abundant in the province.
SNR	**Unranked** - Nation or state/province conservation status not yet assessed.
SU	**Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	**Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	**Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not Provided	Species is not known to occur in the province.
BREEDING STATUS QUALIFIERS	
N	**Nonbreeding** - Conservation status refers to the non-breeding population of the species in the province.
B	**Breeding** - Conservation status refers to the breeding population of the species in the province.
M	**Migrant** - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.
?	**Inexact or uncertain:** Denotes inexact or uncertain numeric rank.
SPECIES AT RISK (SARA) (CANADA AND NEW BRUNSWICK)	
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC)	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

NBDNR GENERAL STATUS OF WILDLIFE	
At risk	Species for which a formal assessment has been completed, and determined to be at risk of extirpation or extinction. To be described by this category, a species must be either listed as endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or the New Brunswick equivalent.
May be at risk	Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment by COSEWIC or the New Brunswick equivalent.
Sensitive	Species which are not believed to be at risk of extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.
Secure	Species that are not believed to be at risk, may be at risk, or sensitive. These are generally species that are widespread and/or abundant. Although some secure species may be declining, their level of decline is not felt to be a threat to their status in the province.
COSEWIC	
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.
Endangered	A wildlife species facing imminent extirpation or extinction.
Threatened	A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Not At Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

3.1.1.1 Species at Risk - Flora

The following species of rare and endangered flora were identified by the ACCDC scan as being present within a 5km radius of the project site (Table 3).

Table 4: Flora Species of Conservation Concern observed within a 5km Radius of subject site.

Scientific Name	Common Name	COSEWIC Status	SARA Status	Provincial Legal Prot.	Prov. Rarity Rank	Prov. GS Rank	# Recs.	Distance from Site
Legally Listed Taxa								
Symphyotrichum laurentianum	Gulf of St. Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	2	0.8 +/- 5.0
Species of Conservation Concern								
Chamaesyce Polygonifolia	Seaside Spurge	-	-	-	S1	2 May be at Risk	2	2.8+/- 5.0

Salix myricoides	Bayberry Willow	-	-	-	S2?	3 Sensitive	1	3.6+/- 5.0
Salix pedicellaris	Box Willow	-	-	-	S3	4 Secure	1	0.7+/- 5.0
Rubus chamaemorus	Cloudberry	-	-	-	S3S4	4 Secure	1	1.6+/- 1.0
Polygonum raii	Sharp-fruited Knotweed	-	-	-	SH	0.1 Extirpated	1	2.2+/- 10.0

The **Gulf of St. Lawrence Aster** (*Symphyotrichum laurentianum)* is listed as "Threatened" under COSEWIC and the federal Species at Risk Act, and listed as Endangered provincially. It is an annual, herbaceous plant measuring between 0.1 and 40 cm in height, and can be simple or divided into several clusters of branches with soft, fleshy and smooth leaves. Flowers are generally white to pinkish-white in colour. This species is only found in Quebec, New Brunswick and PEI (there are 29 known populations, 6 of which are NB). According to Environment Canada, the nearest known population is located at Val Comeau, approximately 5kms south of the proposed project. Gulf of St. Lawrence Aster occurs in coastal habitats such as beaches, lagoons, dunes, dune slacks and dry stretches of salt marshes in moist, sandy soil which floods infrequently (Canada, 2017 http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=252).

The Recovery Strategy for the Gulf of St. Lawrence Aster (*Symphyotrichum laurentianum*) in Canada, 2012 identifies three (3) types of Critical Habitat:

1. *Salt Marshes:*
    a. *The species grows on edges of these marshes which are characterized by salt or brackish water and where vegetation cover is dominated by halophytes (e.g. Pacific Silverweed (Potentilla egedei), Prairie Bulrush (Bolboshchoenus maritimus), Common Three-Square (Schoenoplectus pungens), Smooth Cordgrass (Spartina alterniflora), Spearscale (Atriplex hastate), Baltic Rush (Juncus balticus), Seashore Dock (Rumex maritimus));*
    b. *Suitable habitat corresponds to the area between the mean high tide level and the spring high tide level.*
2. *Dune Slacks:*
    a. *The species grows in inter-dunal hollows;*
    b. *Suitable habitat corresponds to the area between the mean high tide levels on each side of the dune slacks.*
3. *Sand/mud flats:*
    a. *The species grows on these flat areas where there is no defined drainage pattern;*
    b. *Suitable habitat corresponds to the area between the mean high tide level on the ocean side and the mean high tide level on the bay, lagoon or pond side.*

Based on the habitat requirements of this species, the project is not anticipated to be adversely impact the Gulf of St. Lawrence Aster.

The **Seaside Spurge** (*Chamaesyce Polygonifolia)* has a provincial rarity rank of S1 and a GS rank of 2-May be at Risk. It is a sprawling, annual herb found on sand dunes or very sandy earth which flowers from early July to late August and fruits between August and early October. Ranging on the Atlantic Coast between Quebec and Georgia, as well as around the Great Lakes, this species is very specialized in its habitat requirements. As such, the main threat to this species is considered habitat destruction and degradation of coastal dunes.

Based on the habitat requirements of this species, the project is not anticipated to adversely impact the Seaside Spurge.

Bayberry Willow (*Salix myricoides*) has a provincial rank of S1 and a GS rank of 3-Sensitive. It is a perennial shrub which typically grows on dunes or alongside lakes. Based on the habitat requirements of this species, the project is not anticipated to adversely impact Bayberry willow.

Box Willow (Salix *pedicellaris*) has a provincial rank of S3 and a GS rank of 4-secure, and is a woody shrub that typically grows in fens, wetlands or along the shores of rivers or lakes. Based on the habitat requirements of this species, the project is not anticipated to adversely impact Box willow.

Cloudberry *(Rubus chamaemorus)* has a provincial rank of S3S4 and a RS rank of 4-secure. This plant is a low, creeping perennial that prefers moist tundra, bog or heath habitats, usually found with sphagnum moss or lichen spp., and widespread across the low arctic and boreal forest regions. Based on the habitat requirements of this species, the project is not anticipated to adversely impact cloudberry.

Sharp-fruited Knotweed *(Polygonum raii)* has a rarity rank of SH and a GS rank of 0.1 extirpated. It is a tidal plant which prefers coastal beaches, dunes and shores. Based on the habitat requirements of this species, the project is not anticipated to adversely impact Sharp-fruited Knotweed.

3.1.1.2 Species at Risk – Fauna

A request to the ACCDC returned a list of sixty-six (66) bird SOCC observed within a 5km radius of the subject site, including waterfowl, shorebird and songbird species, among others. Each species breeding/nesting windows and habitat requirements were reviewed for each species and compared to the subject site. Migratory waterfowl are known to use the existing ponds as sheltered, open water staging areas in the fall; however due to the project schedule, construction is anticipated to occur during the fall migration, which will discourage these species from using the ponds, and they are anticipated to continue to other, open water areas. Refer to the following sections for an analysis of the remaining twenty (20) species' habitat requirements in relation to the subject site.

Table 5: Bird Species of Conservation Concern within 5-Km Radius of Site (ACCDC)

	Scientific Name	Common Name	COSEWIC	SARA	Provincial Legal Prot.	Provincial Rarity Rank	Provincial GS Rank	# of Recs.	Distance (km)
	Legally Listed Taxa								
1	*Charadrius melodus melodus*	Piping Plover melodus spp.	Endangered	Endangered	Endangered	S1B, S1M	1 At Risk	138	2.0±7.0
2	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	-	Endangered	S2M	1 At Risk	16	2.3±0.0
3	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B, S2M	1 At Risk	2	0.1±0.0
4	*Riparia riparia*	Bank Swallow	Threatened	-	-	S2S3B, S2S3M	3 Sensitive	9	1.6±1.0

5	*Hirundo rustica*	Barn Swallow	Threatened	-	Threatened	S3B, S3M	3 Sensitive	6	0.1±0.0
6	*Dolichonyx oryzivorus*	Bobolink	Threatened	-	Threatened	S3B, S3M	3 Sensitive	5	2.0±7.0
7	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B, S4M	1 At Risk	3	2.0±7.0
8	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B, S3S4M	1 At Risk	1	2.0±7.0
9	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B, S3S4M	1 At Risk	4	0.9±1.0
10	*Vermivora chrysoptera*	Golden-winged Warbler	Threatened	Threatened		SNA	8 Accidental	1	0.9±1.0
11	*Bucephala islandica (eastern pop.)*	Barrow's Goldeneye – Eastern pop.	Special Concern	Special Concern	Special Concern	S2M, S2N	3 Sensitive	8	0.1±0.0
12	*Phalaropus lobatus*	Red-necked phalarope	Special Concern			S3M	3 Sensitive	1	0.9±1.0
13	*Contopus virens*	Eastern Wood Pewee	Special Concern		Special Concern	S4B, S4M	4 Secure	4	2.0±7.0
14	*Sterna hirundo*	Common Tern	Not at Risk	-	-	S3B, SUM	3 Sensitive	44	0.1±0.0
15	*Podiceps grisegena*	Red-necked Grebe	Not at Risk	-	-	S3M, S2N	3 Sensitive	1	3.7±1.0
16	*Tringa melanoleuca*	Greater Yellowlegs	-	-	-	S1?B, S5M	4 Secure	33	2.3±0.0
17	*Aythya Americana*	Redhead	-	-	-	S1B, S1M	8 Accidental	1	0.9±0.0
18	*Phalaropus tricolor*	Wilson's Phalarope	-	-	-	S1B, S1M	3 Sensitive	7	0.1±0.0
19	*Oxyura jamaicensis*	Ruddy Duck	-	-	-	S1B, S2S3M	4 Secure	5	0.1±0.0
20	*Aythya affinis*	Lesser Scaup	-	-	-	S1B, S4M	4 Secure	11	0.1±0.0
21	*Aythya marila*	Greater Scaup	-	-	-	S1B, S4M, S2N	4 Secure	7	0.1±0.0
22	*Eremophila alpestris*	Horned Lark	-	-	-	S1B, S4N, S5M	2 May be at Risk	6	1.6±7.0
23	*Sterna paradisaea*	Arctic Tern	-	-	-	S1B, SUM	2 May be at Risk	4	1.6±7.0
24	*Branta bernicla*	Brant	-	-	-	S1N, S2S3M	4 Secure	17	2.7±1.0
25	*Chroico-cephalus ridibundus*	Black-headed Gull	-	-	-	S1N, S2M	3 Sensitive	3	0.9±1.0
26	*Butorides virescens*	Green Heron	-	-	-	S1S2B, S1S2M	3 Sensitive	2	2.0±7.0
27	*Nycticorax*	Black-	-	-	-	S1S2B,	3	7	0.9±1.0

	nycticorax	crowned Night-heron				S1S2M	Sensitive		
28	*Mimus polyglottis*	Northern Mockingbird	-	-	-	S2B, S2M	3 Sensitive	4	1.6±7.0
29	*Toxostoma rufum*	Brown Thrasher	-	-	-	S2B, S2M	3 Sensitive	5	2.0±7.0
30	*Pooecetes gramineus*	Vesper Sparrow	-	-	-	S2B, S2M	2 May be at Risk	5	1.5±7.0
31	*Anas strepera*	Gadwall	-	-	-	S2B, S3M	4 Secure	23	0.1±0.0
32	*Pinicola enucleator*	Pine Grosbeak	-	-	-	S2B, S4S5N, S4S5M	3 Sensitive	1	1.6±7.0
33	*Tringa solitaria*	Solitary Sandpiper	-	-	-	S2B, S5M	4 Secure	9	0.8±0.0
34	*Chen caerulescens*	Snow Goose	-	-	-	S2M	4 Secure	1	3.7±1.0
35	*Somateria spectabilis*	King Eider	-	-	-	S2N, S2M	4 Secure	1	3.7±1.0
36	*Larus hyperboreus*	Glaucous Gull	-	-	-	S2N, S2M	4 Secure	1	0.1±0.0
37	*Anas clypeata*	Northern Shoveler	-	-	-	S2S3B, S2S3M	4 Secure	2	0.1±0.0
38	*Petrochelidon Pyrrhonota*	Cliff Swallow	-	-	-	S2S3B, S2S3M	3 Sensitive	1	2.0+/-7.0
39	*Calcarius lapponicus*	Lapland Longspur	-	-	-	S2S3N, SUM	3 Sensitive	2	3.7±1.0
40	*Carduelis pinus*	Pine Siskin	-	-	-	S3	4 Secure	5	1.6±1.0
41	*Rallus limicola*	Virginia Rail	-	-	-	S3B, S3M	3 Sensitive	1	2.0±7.0
42	*Charadrius vociferous*	Killdeer	-	-	-	S3B, S3M	3 Sensitive	18	2.0±7.0
43	*Tringa semipalmata*	Willet	-	-	-	S3B, S3M	3 Sensitive	28	2.0±7.0
44	*Coccyzus erythrop-thalmus*	Black-billed Cuckoo	-	-	-	S3B, S3M	4 Secure	1	2.0±7.0
45	*Molothrus ater*	Brown-headed Cowbird	-	-	-	S3B, S3M	2 May be at Risk	6	2.0±7.0
46	*Icterus galbula*	Baltimore Oriole	-	-	-	S3B, S3M	4 Secure	2	2.0±7.0
47	*Cocco-thraustes vespertinus*	Evening Grosbeak	-	-	-	S3B, S3S4N, SUM	3 Sensitive	3	2.0±7.0
48	*Somateria mollissima*	Common Eider	-	-	-	S3B, S4M, S3N	4 Secure	9	2.7±1.0
49	*Dendroica tigrina*	Cape May Warbler	-	-	-	S3B,	4 Secure	4	0.9±1.0

						S4S5M			
50	*Anas acuta*	Northern Pintail	-	-	-	S3B, S5M	3 Sensitive	43	0.1±0.0
51	*Mergus serrator*	Red-breasted Merganser	-	-	-	S3B, S5M, S4S5N	4 Secure	16	0.9±1.0
52	*Arenaria interpres*	Ruddy Turnstone	-	-	-	S3M	4 Secure	24	2.3±0.0
53	*Melanitta nigra*	Black Scoter	-	-	-	S3M, S1S2N	3 Sensitive	5	0.9±1.0
54	*Bucephala albeola*	Bufflehead	-	-	-	S3M, S3N	3 Sensitive	2	0.1±0.0
55	*Calidris martima*	Purple Sandpiper	-	-	-	S3M, S3N	4 Secure	1	3.7±1.0
56	*Tyrannus tyrannus*	Eastern Kingbird	-	-	-	S3S4B, S3S4M	3 Sensitive	5	2.0±7.0
57	*Actitis macularius*	Spotted Sandpiper	-	-	-	S3S4B, S5M	4 Secure	31	2.0±7.0
58	*Gallinago delicata*	Wilson's Snipe	-	-	-	S3S4B, S5M	4 Secure	6	2.0±7.0
59	*Larus delawarensis*	Ring-billed Gull	-	-	-	S3S4B, S5M	4 Secure	47	0.1±0.0
60	*Dendroica striata*	Blackpoll Warbler	-	-	-	S3S4B, S5M	4 Secure	1	0.9±1.0
61	*Pluvialis squatarola*	Black-bellied Plover	-	-	-	S3S4M	4 Secure	23	2.3±0.0
62	*Limosa haemastica*	Hudsonian Godwit	-	-	-	S3S4M	4 Secure	19	2.3±0.0
63	*Calidris pusilla*	Semi-palmated Sandpiper	-	-	-	S3S4M	4 Secure	26	2.3±0.0
64	*Calidris melanotos*	Pectoral Sandpiper	-	-	-	S3S4M	4 Secure	2	2.3±0.0
65	*Calidris alba*	Sanderling	-	-	-	S3S4M, S1N	3 Sensitive	12	0.9±1.0
66	*Morus bassanus*	Northern Gannet	-	-	-	SHB, S5M	4 Secure	8	2.9±0.0

The proposed project site contains two (2) distinct habitat types that may be used by migratory birds for nesting or foraging, namely:

- Open Area with Low Vegetation (lawn). This is located along the tops and sides of the vegetated lagoon berms, and is generally sloped, with the exception of the top of the berms which is used as an access road. The site contains approximately 2.63 ha of lawn, of which half (**1.32 ha**) will be directly impacted by the project.

This area is mowed regularly be municipal staff, and is therefore not considered good nesting habitat; however, for the sake of this assessment and the precautionary principle, it was considered as nesting and foraging habitat.

- Open Water: The lagoon's existing ponds contain open water year-round, which may be used for nesting and foraging by waterfowl species, and other species that forage over open water. The ponds are also used by migrating waterfowl as a staging area in the fall. Each lagoon is approximately 900m^2 in size for a total of **1,800m^2** open water habitat.

  It should be noted that the mowing of the site by staff extends to the lagoon's water edge, and therefore eliminates vegetation for nesting cover along the pond shores. Nevertheless, the open lagoon can be considered foraging and protection habitat for a variety of waterfowl species. Based on staff observations, many of the waterfowl species nesting on site nest in the perimeter woods, using the ponds for feeding and protection.

Refer to section 4 for the potential project effects on migratory bird species of conservation concern.

3.1.1.3 Species of Conservation Concern – Invertebrate

The following insect species were identified as occurring within the 5km ACCDC radius (table 5).

Table 6: Invertebrate Species of Conservation Concern within the 5km ACCDC Buffer.

Scientific Name	Common Name	COSEWIC Status	SARA Status	Provincial Legal Protection	Prov. Rarity Rank	Prov. GS Rank	# Recs.	Distance from Site
Species of Conservation Concern								
Pipilio brevicauda bretonensis	Short-tailed Swallowtail	-	-	-	S3	4 Secure	1	4.5±0.0
Lycaena dospassosi	Salt Marsh Copper	-	-	-	S3	4 Secure	1	4.5±0.0
Plebejus idas	Northern Blue	-	-	-	S3	4 Secure	1	0.9±1.0
Coccinella transversoguttata richardsoni	Transverse Lady Beetle	-	-	-	SH	2 May be at Risk	1	1.3±1.0

The Short-tailed Swallowtail (*Pipilio brevicauda bretonensis)* is a medium-sized butterfly, typically found in gardens, coastal areas and can be seen flying over grassy cliff tops and rocky beaches, inland meadows and mountains areas close to the treeline. The proposed project is not anticipated to adversely impact the Short-tailed Swallowtail.

The **Salt Marsh Copper** (*Lycaena dospassosi)* is only found in salt marshes along the Bay of Chaleur and the Gaspé Peninsula. The proposed project is not anticipated to adversely impact this species.

The **Northern Blue** (*Plebejus idas*) is most common on coastal headlands where Black Crowberry is often a major flora constituent, or in bogs where the Crowberry is almost overwhelmed by sphagnum. The proposed project is not anticipated to adversely impact this species.

The **Transverse Lady Beetle** (*Coccinella transversoguttata richardsoni*) is a typical lady beetle that historically occurs in countries throughout the world in any number of habitats and vegetation types. The proposed project is not anticipated to adversely impact this species.

3.1.1.4 Species of Conservation Concern – Mammals

Table 7: Mammal Species of Conservation Concern Identified within 5 km of the Subject Site

Scientific Name	Common Name	COSEWIC Status	SARA Status	Provincial Legal Protection	Prov. Rarity Rank	Prov. GS Rank	# Recs.	Distance from Site
Species of Conservation Concern								
Odobenus rosmarus rosmarus	Atlantic Walrus	Special Concern	-	Extirpated	SX	4 Secure	1	0.9±1.0

The maritime population of the Atlantic Walrus was heavily hunted in the 17th and 18th centuries, to the point that it was extirpated from the region by the end of the 18th century. Four Canadian populations remain in South and East Hudson Bay, Northern Hudson Bay – Davis Strait, Foxe Basin, and Baffin Bay (High Arctic).

The proposed project is not anticipated to adversely impact this extirpated species.

3.1.1.5 Location Sensitive Species of Conservation Concern

In addition to the species identified by ACCDC as occurring within a 5km radius of the subject site, the following species are location-sensitive, meaning that they are known to occur within the region and therefore are likely to occur within proximity to the project (Table 7).

Table 8: Location-Sensitive Species of Conservation Concern

Scientific Name	Common Name	COSEWIC Status	SARA Status	Provincial Legal Protection	Prov. Rarity Rank	Prov. GS Rank	# Recs.	Distance from Site
Species of Conservation Concern								
Haliaeetus leucocephalus	Bald Eagle	-	-	Endangered	-	-	-	-

Atmospheric

No ambient air quality monitoring stations are located in the Tracadie region. The nearest industrial emission source is located over 50km away.

Based on the lack of industrial emitters, ambient air quality in the region is assumed to be very good to excellent. Winds are predominantly from the west and south, therefore the majority of the time, odours

from the lagoon are blowing away from residential receptors and out to Tracadie Bay. A small percentage of winds (averaged monthly) blow towards nearby residences; however, based on a discussion with Municipal Staff, no odour complaints have been received regarding the operation of existing lagoons.

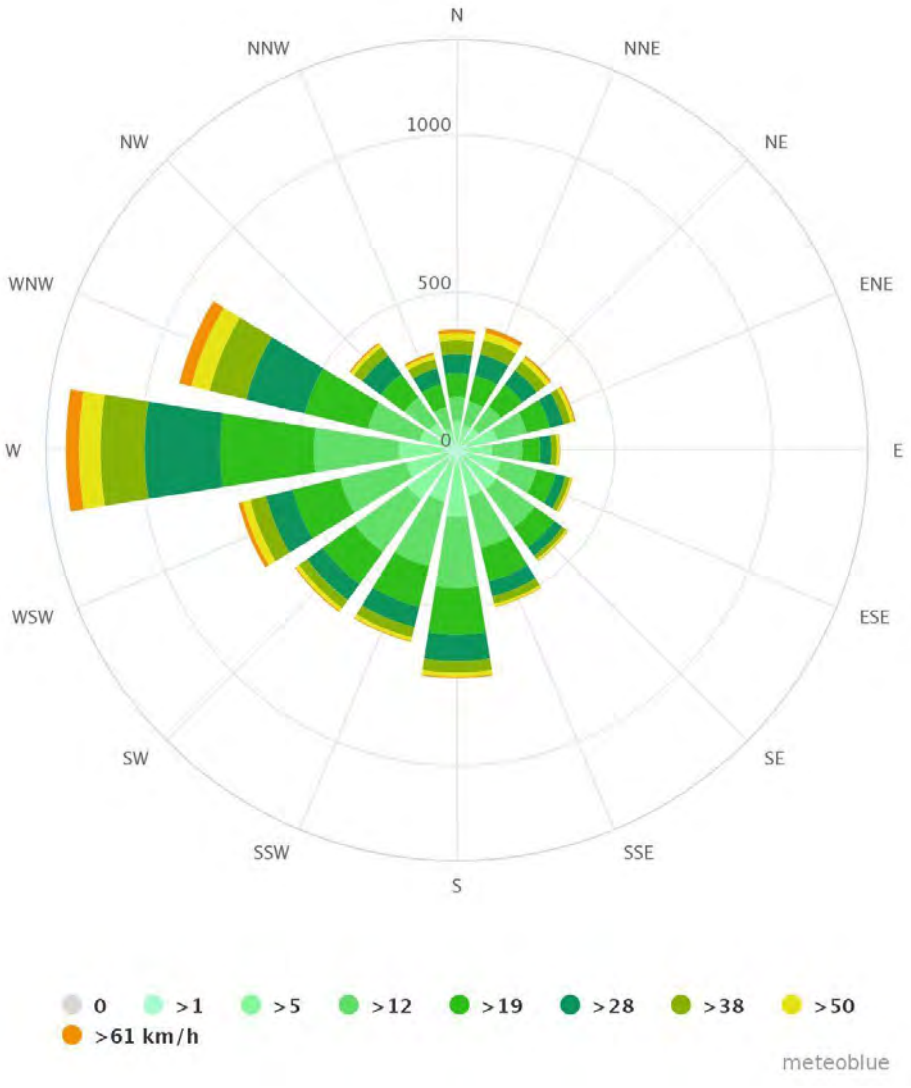


Figure 4. Wind Rose Diagram for Tracadie-Sheila (www.meteoblue.com)

Environmentally Significant Areas

A review of the Nature Trust NB Environmentally Significant Area (ESA) database found several ESAs within a 5.0 km radius of the subject site:

- **ESA #187 Green Point South (Tracadie Dune):**

This is the northern portion of the Tracadie Dune, extending south from Green Point and Four Roads. It consists of an 8km low-lying sand dune and salt marsh that receives extreme levels of disturbance. It,

however, consistently supports 4-5 pair of nesting Piping Plover.

- **ESA #191 Le Sentier Écologique La Découverte:**

On the east side of Highway 11, just north of the Tracadie Town Limits, at the "Centre development de L'Enfant." This is a narrow strip of land extending to the Bay. The mixed coastal forest and partially treed coastal bog is very characteristic of this coastal region. No rare plants or animals have been observed at this site; however increasing development in the area may make this site more valuable as a natural green space.

- **ESA # 196 Pointe à Bouleau/Ile au Cheval Beach** :

Located at the mouth of Little Tracadie River, this dune extends from Tracadie dune in the north to Ile au Cheval in the south. It is no longer connected to the mainland, but is accessible by wading at low tide. This peninsula is ~3.5 km. long, featuring a salt marsh, sand dunes, a rare plant community, and one of the most important breeding sites for Piping Plover in the province.

- **ESA#202 Tracadie Beach, Sandspit and Lagoon**

This ESA is located offshore from Tracadie, this dune, which separates Tracadie Bay from the Gulf of St. Lawrence, is located between Tracadie Beach Green Point and Point a Bouleau. The area totals 5.5 km. in length, comprising dynamic sand dunes and shallow, poorly drained salt marshes with sand and mud bottom and Eel Grass beds. It supports rare plants, and nesting colonies of Common Tern (500 pair in 1993; colony "crashed in 1994), Herring Gull and Ring-billed Gull.

- **ESA#203 Tracadie Sewage Lagoon**

This ESA consists of the Tracadie municipal sewage lagoon, which is surrounded by mixed forest and serves as a breeding and roosting location for birds, many of which are rare on the Acadian Peninsula. Over 120 different species have been recorded from this site, making it one of the best birding spots on the peninsula. Almost every species of waterfowl that has been recorded on the Acadian Peninsula has been seen at this site.

Refer to figure 5 for locations of the ESAs noted above.

IBACanada.ca was consulted to determine which, if any, Important Bird Areas (IBA) were located near the proposed project. The subject site is located within the boundary of the following IBA:

- **IBA NB014 Tracadie Bay and Sandspit:** As noted in ESA# 202 and #203 above, this IBA is characterized by an 8km stretch of barrier beaches with several wash-overs and sand dunes along the eastern shore. The area supports a significant population of the globally vulnerable (and nationally endangered) Piping Plover. In addition to Piping Plovers, the area is also a staging area for various waterfowl (including Barrow's Goldeneye) and shorebird species. In the fall, several hundred Canada Geese and thousands of shorebirds, such as Semipalmated Sandpipers and Semipalmated Plovers are recorded. On some fall outings, in excess of 200 Ruddy Turnstones and 300 White-rumped Sandpipers have been observed.

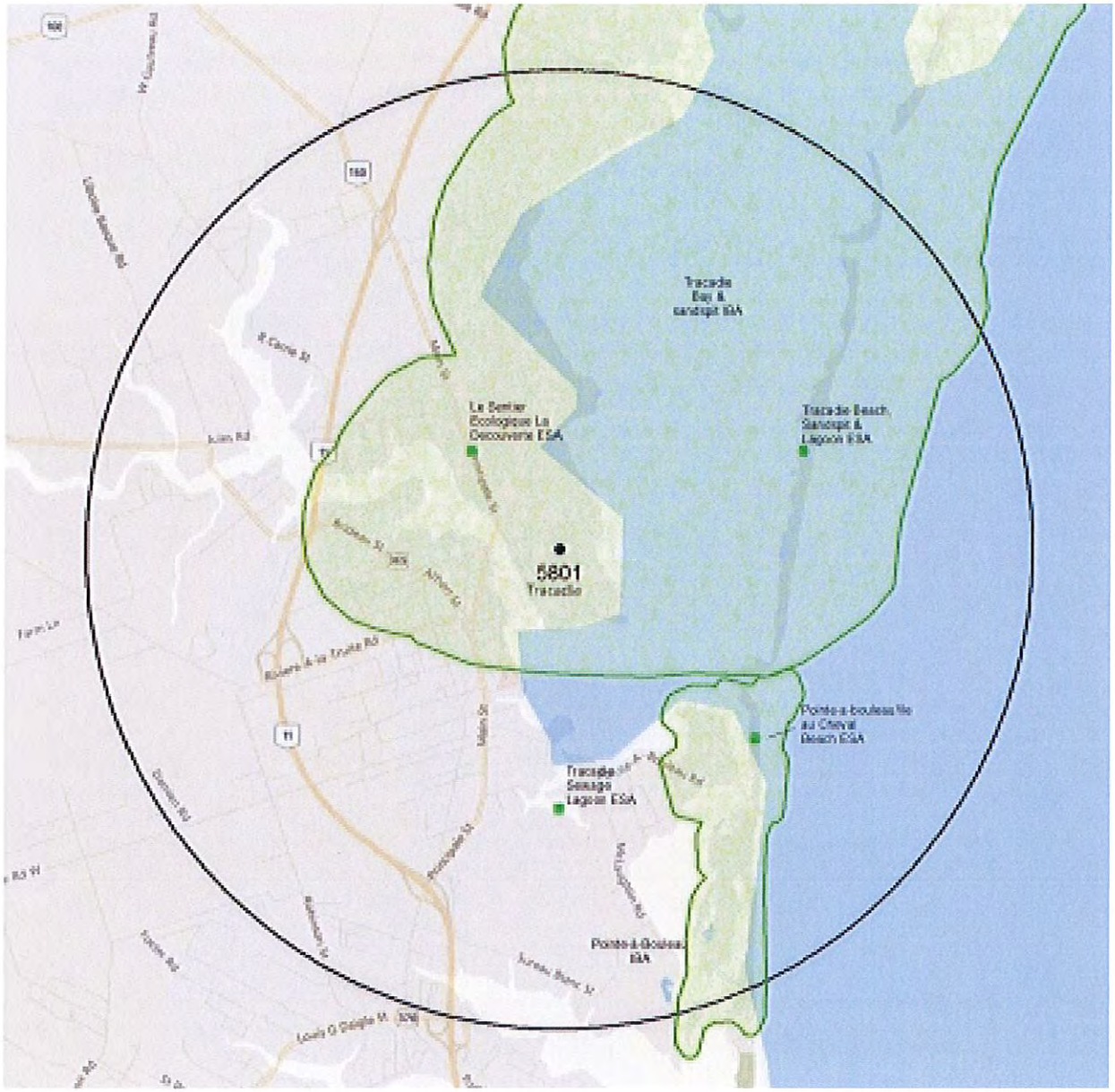


Figure 5. ESA location map.

The following IBA is located in proximity to the subject site:

- **NB 028 Pointe-à-Bouleau**: This 500m-wide sandspit is a barrier beach with two swift-flowing channels with low-lying sand dunes and beaches, located approximately 2.5km south of the subject site. The area supports a significant breeding population of Piping Plover, as well as staging waterfowl such as Ruddy Turnstones, White-rumped Sandpipers, Semipalmated Sandpipers and others are recorded. Point-à-Bouleau also supports a large concentration of foraging Osprey during the summer.

Archaeological Resources

An information request was made to the Archaeological Services Unit (ASU) of the NB Dept. of Tourism, Heritage and Culture to identify any known archaeological or heritage resource sites, or areas of high potential within the vicinity of the project. Based on the information provided by ASU, there are three (3) pre-contact archaeological sites near the existing WWTP, located east of the site along the coastline of Tracadie Bay.

The proposed project intersects the 200m buffer of site ID number CjDf-7a. As such, any work within this buffer area will require an excavation permit from Tourism, Heritage and Culture. An application for the excavation permit has been submitted to THC and will be obtained prior to project initiation.

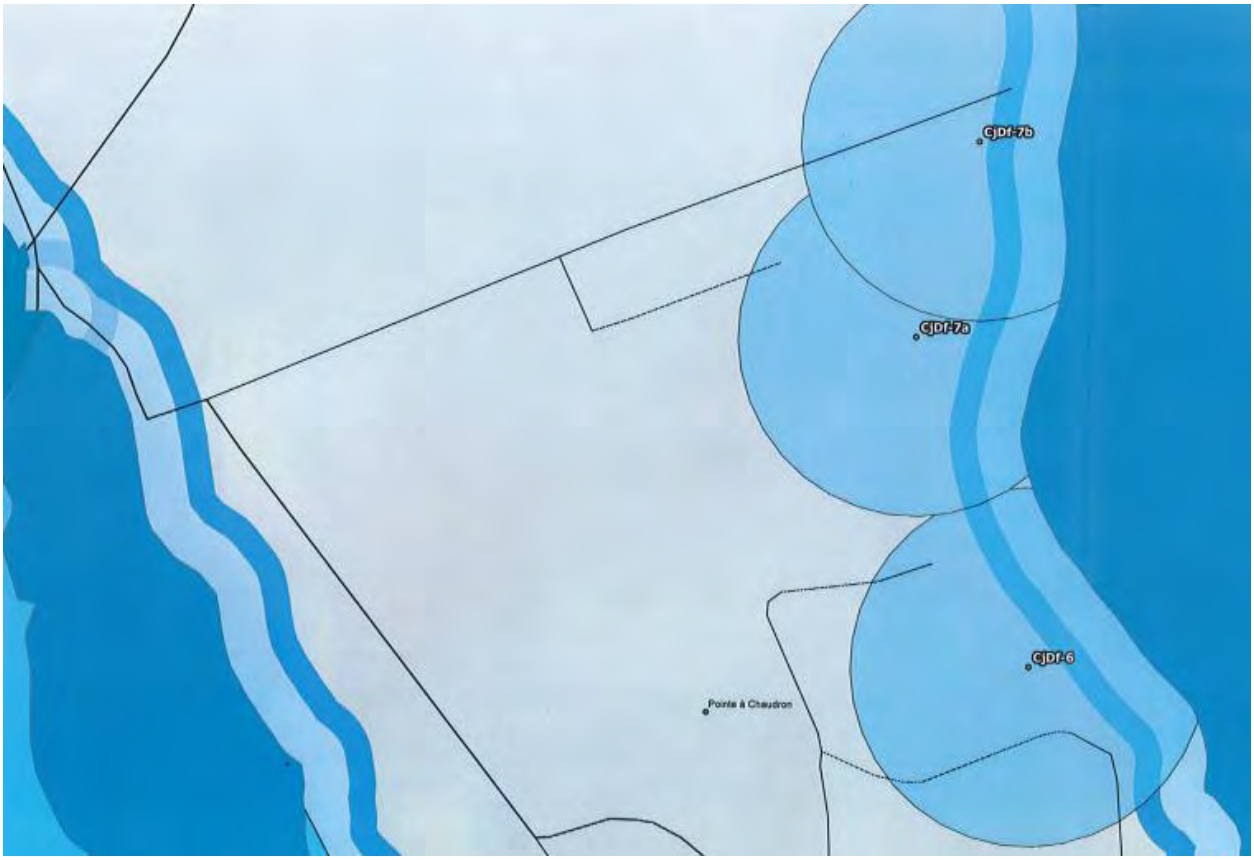


Figure 6: Identified Archaeological Resources

Land Use

The project is proposed on land owned by the Regional Municipality of Tracadie, and contains the Town's existing WWTP. The subject site is located in an area dominated to the north and east by forest and wetland, and to the south and west by residential and institutional land use. The subject site is within the Tracadie municipal boundary and is zoned "lagoon" and "N" Natural. Refer to Appendix F for the Municipality of Tracadie zoning map.

The Tracadie WWTP is surrounded by a treed buffer, between 40m and 230m wide. Neighbouring land uses include a residential area to the west of the site along chemins de la Block, de la Chapelle and le Royer. A collection of cottages and the Two Rivers Resort (and Spa) occupies the southern portion of Pointe à Chaudron.

No Land Gazette environmental property flags exist for the subject property.

3.2 SOCIOECONOMIC CONDITIONS

Population and Economy

The Regional Municipality of Tracadie, which now includes the former Village of Sheila and the unincorporated area of Saumarez, became the Town of Tracadie-Sheila in 1992. According to the Canada Census Bureau, the population was 4,933 in 2011.

The municipality is known as the centre for services in the entire Acadian Peninsula. The local economy is diverse, including fish plants, commercial fishing, large- and medium-sized manufacturers in metal fabrication, home building and cabinets, and commercial services like shopping and restaurants.

Heritage Sites

A review of information provided by the ASU and the www.Historicplaces.ca website shows one (1) heritage site in proximity of the proposed project. The Block Wharf is a relict wooden wharf located in Tracadie Bay near the end of de la Block Street, approximately 300m north east of the WWTP. The wharf, which is only visible at low tide, was built circa 1835. This site will not be adversely impacted by the proposed project.

Tourism

Tracadie is located on the Acadian Peninsula, an area known for its beaches, natural beauty, bird watching, Acadian festivals and heritage, hiking and camping. Winter tourism includes outdoor activities including snowmobiling and cross-country skiing.

Summer tourism events include *La Ruée vers l'arts*, held annually in July, and *la Semaine de la Fête des Acadiens et Acadiennes*, held in August.

4. ENVIRONMENTAL ASSESSMENT OF POTENTIAL IMPACTS

Based on the project description and the existing environment the following Valued Environmental Components (VECs) were identified for the EIA:

a) Migratory birds, bird habitat;
b) Species at Risk;
c) Atmospheric Quality;
d) Archaeological Resources;
e) Groundwater Quality, and
f) Surface Water Quality

A qualitative rating system was used to evaluate the potential for interactions between the project and the environment. A rating was given to each Valued Environmental Component (VEC) based on a rating system according to professional judgement and experience of the consultant.

0 = No interaction anticipated.
1 = Interaction occurs; however, it is unlikely to result in a significant environmental effect even without mitigation, or it is unlikely to be significant because of mitigation measures.
2 = Interaction could potentially result in an environmental effect.

Where there is a potential for project-VEC interaction (ratings of 1 or 2), further discussion is provided in the following sections. For issues where there is limited interaction (ratings 0 or 1), a rationale is provided and the issue is not discussed further in the present report. Potential project-environment interactions are presented in Table 8.

Table 9: Potential Project-Environment Interactions Matrix

Activities / Potential VEC	Construction / Installation of the Physical Work	Operation / Maintenance of the Physical Work	Decommissioning / Abandonment of the Physical Work	Accidents and Unplanned Events
Biophysical				
Migratory Birds	1	0	1	1
Species at Risk	1	0	1	1
Atmospheric Quality	1	1	1	1
Groundwater	1	0	1	1
Surface Water	1	0	1	0
Wildlife Habitat	1	0	1	0
Socio-Economic				
Land Use	0	0	0	0
Archaeological Heritage Resources	1	0	1	0
Human Health	0	0	0	0
Economy/Jobs	1	1	1	0

The potential VECs that have a rating of zero for all activities indicate that that particular VEC is not present within or in proximity to the project's footprint. The rationales for excluding these VECs from further assessment are discussed in the following sections.

Significance of potential environmental effects is also evaluated in this section, based on a consideration of four (4) characteristics of the project-VEC interaction:

1. Likelihood: what is the likelihood of the impact on the VEC?
2. Spatial scale: how large an area/how many of the VEC will be impacted?
3. Duration of impact: how long will the VEC be impacted? and
4. Mitigation: What mitigation measures can be employed to minimize the impact, and how efficient?

4.1 LAND USE

The proposed project will be completed within the existing WWTP footprint, which is already zoned for the intended purpose. No known land-use conflicts exist with neighbouring landowners. Given the status quo nature of the project, land use is not likely to be adversely impacted by the proposed project.

4.2 HUMAN HEALTH

The operation of the WWTP will improve the effluent treatment efficiency of the lagoon, thereby improving the water quality in the Little Tracadie River and Tracadie Bay. The construction of the project will employ qualified, certified and experienced contractors and standard safe work practices and equipment will be used on site. Furthermore, the construction zone will be limited to only authorized personnel. As such, the proposed project is not anticipated to adversely impact human health of neighbouring landowners, contractors or the employees of the WWTP, and therefore no mitigation is recommended.

4.3 ECONOMY/JOBS

The proposed project will create short-term, direct construction employment for local contractors, but will have no long-term direct employment impacts. However, it is important to note that a functioning wastewater collection and treatment system is vital to a community's overall well-being, and the upgraded and expanded plant will continue to be an important component of the services offered by the Regional Municipality of Tracadie. Based on this, the project is not anticipated to adversely impact jobs/economy in the region, and therefore no mitigation is recommended.

4.4 MIGRATORY BIRDS

Existing Conditions:

At present, the WWTP ponds are an Environmentally Significant Area for migratory birds, due to its sheltered nature, its placement within the waterfowl migration route, its proximity to the coast, and the fact that it contains open water late into the fall/winter migration period. This attracts waterfowl and shorebird species to the site which are either not common to the province, or in large numbers.

The proponent recognizes its responsibility under the MBCA regulations; However, due to its complexity and scope, the project is constrained by the construction season and deadlines associated with the federal funding program, and therefore it must be initiated during the summer bird breeding season, and continue through the late summer into the fall until freeze-up, when construction will no longer be possible. As such, the potential Risk Factors to migratory birds associated with this project have been eliminated or reduce as much as possible.

Project-VEC Interactions, Potential Environmental Effects:

The draining of water and excavation of the existing, as well as general construction activities at the site, are expected to continue until November 2017.

Draining the existing ponds, and construction within the grassed areas between and surrounding the ponds may remove potential breeding, foraging and nesting habitat (water, shoreline vegetation and grassed areas) for some species of waterfowl and other bird species, as well as preventing waterfowl from staging in these areas for the fall migration. This includes **1.32 ha** of open, low vegetation (lawn) located along the tops and sides of the pond berms, as well as **1,800m^2** open water habitat within the ponds.

Although identifying nests is often difficult, the proposed work area is open (open water, grassed berms) and devoid of shrubs, cattails and other suitable nesting vegetation. Municipal staff routinely cut back the vegetation on site, including the lawn areas and interior berms, extending to the water's edge. This activity is anticipated to discourage nesting in these areas, and permit any nests to be easily identified.

Environment Canada states that where maintenance of human-built structures is necessary during the breeding season, appropriate systems may be installed to prevent birds from nesting. As such, the following mitigation measures will be implemented to reduce the risk of potential disturbance or incidental take of breeding waterfowl in the lagoon, based on Environment Canada's guidance document "Reducing Risk to Migratory Birds" and Technical Information documents:

Recommended Mitigation:

- As soon as the snow melts and the banks are stable, municipal staff will continue the ongoing maintenance program of mowing the vegetation along the pond edges. This will continue on a regular basis to discourage waterfowl from nesting in the lagoon shoreline/edge areas;
- Hawk, owl and/or fox deterrents will be strategically placed around the ponds to discourage waterfowl from nesting in the ponds;
- Project work, as much as practical, will be scheduled to avoid nesting periods of any waterfowl species which may breed in the ponds;
- Water will be maintained in the lagoon during the migration period to maintain as much open water as possible;

- All work will cease and a qualified biologist will be contacted in the event an active nest is discovered within the pond to be drained.

Significance of Potential Impacts

Based on the temporary nature of the project, the availability of other, similar shoreline habitats along the coast, and the recommended mitigation noted above, the risk to migratory birds as a result of the project is considered acceptable.

4.5 SPECIES AT RISK

As noted in section 4.4, the WWTP lagoon is an Environmentally Significant Area for waterfowl and shorebirds, for nesting but primarily for use as a staging area during the fall migration. This includes bird Species at Risk and Species of Conservation Concern.

Project-VEC Interactions, Potential Environmental Effects:

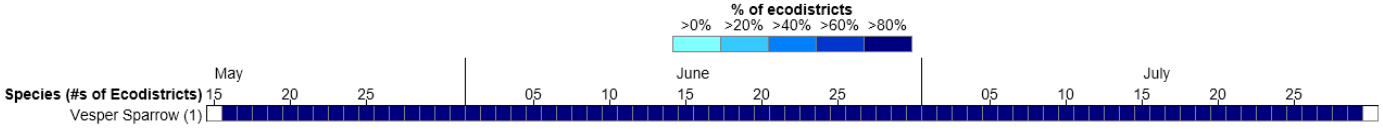
As noted in section 4.4, the proposed project will directly impact two (2) specific habitat types located within the project footprint: nesting habitat within the grassed areas between ponds, and the open water and shoreline within the ponds.

The critical breeding/nesting habitat requirements for each species identified in the ACCDC scan was cross-referenced with the site characteristics to determine which species may be impacted by the proposed project. This analysis also takes into account the breeding ranges for these birds.

Based on this, the following species may be impacted by the draining, excavation and other construction activities proposed within the ponds and the grassed berms:

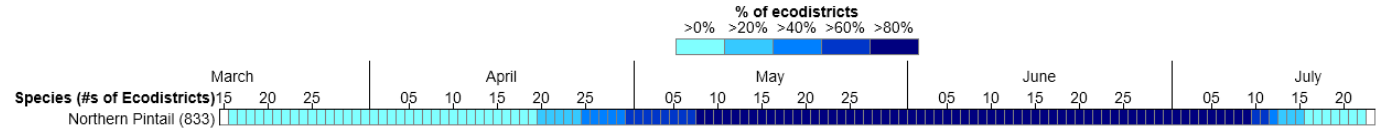
Horned Lark (*Eremophila alpestris*) has a provincial rarity rank of S1B, S4N, S5M and a GS rank of 2-May be at Risk. The horned lark is a small, social bird that prefers bare ground, such as open fields with little/no vegetation, such as agricultural fields, grassed airstrips, sage shrub land, coastal beaches and even alpine tundra. New Brunswick is within the far southeastern edge of the breeding range of this species. The proposed excavation of the grassed berms at the site could potentially impact the foraging and nesting of this species.

Vesper Sparrow (*Pooecetes gramineus*) has a provincial rarity rank of S2B, S2M and a GS rank of 2-May be at Risk. This sparrow typically prefers open habitats with grass, such as prairie, meadows, pastures or roadsides. New Brunswick is within the breeding range of this species. The proposed excavation of the grassed berms at the site could impact the foraging and nesting of this species.

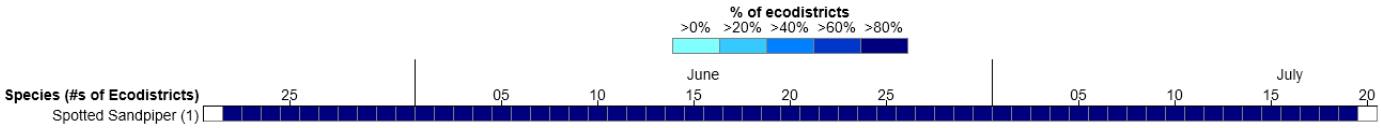


Northern Pintail (*Anas acuta*) has a provincial rarity rank of S3B, S5M and GS rank of 3-sensitive. The pintail nest and forages in a variety of habitats, and constructs their nests in open areas with low vegetation, typically in shallow wetlands. New Brunswick is within the breeding range of this species.

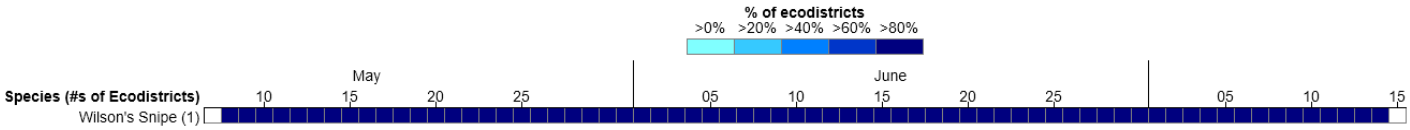
The proposed excavation of the grassed berms and dewatering of the existing ponds could impact the foraging and nesting habitat of this species.



Spotted Sandpiper (Actitis mcularius) has a provincial rarity rank of S3S4B, S5M and GS rank of 4-secure. This species forages for food along rocky shores of fresh and saltwater marshes, inlets, ponds and brooks, and nests are typically constructed within 100m of waterbodies near thicker vegetation for cover. New Brunswick is within the breeding range of this species. The proposed excavation of the grassed berms and dewatering of the existing ponds could impact the foraging and nesting of this species.



Wilson's Snipe (*Gallinago delicata*) has a provincial rarity rank of S3S4B, S5M and GS rank of 4-secure. This species forages for food in shallow, muddy and wet areas in various settings, including bogs, fens, alder and willow swamps, and along rivers and ponds. Nests are typically constructed of a depression in moist soil, usually near or surrounded by water and well-hidden in tall grass, sedges or cattails. New Brunswick is within the breeding range of this species. The proposed excavation of the grassed berms and dewatering of the existing ponds could impact the foraging and nesting of this species.



<u>Recommended Mitigation:</u>

- As soon as the snow melts and the banks are stable, municipal staff will continue the ongoing maintenance program of mowing the vegetation along the pond edges. This will continue on a regular basis to discourage waterfowl from nesting in the lagoon shoreline/edge areas;
- Hawk, owl and/or fox deterrents will be strategically placed around the ponds to discourage species at risk from nesting in the ponds;
- Project work, as much as practical, will be scheduled to avoid nesting periods of any waterfowl species which may breed in the ponds;
- The lagoon ponds will be drained in succession, not concurrently, maintaining as much open water as possible;
- In instances where a species at risk is suspected of nesting or exhibiting breeding behaviour, all work will cease and a qualified biologist will be contacted to confirm the presence of the species, and to identify a suitable buffer distance to be maintained until the SAR nesting period is complete.

Significance of Potential Impacts

The majority of work will be conducted on existing east pond and the grassed area around the pond. This work will be temporary for 1 season only – the site will be returned to its current state for 2018. Furthermore, the above-noted species' preferred habitat includes coastal marshes, rocky shorelines and beaches; therefore the probability of nesting within the project site is unlikely, given the proposed mitigation. As such, the risk to Species at Risk from the project is considered acceptable.

4.6 ATMOSPHERIC QUALITY – ODOUR

Project-VEC Interactions, Potential Environmental Effects:

The proposed project will require draining the lagoon ponds in succession, and managing the sludge (semi-solid waste) to permit the modifications to each pond. As noted in section 3.1.4, the ambient air quality in the area is considered very good, and the majority of the wind (averaged monthly) predominantly blows away from the nearby residential receptors. However, on days with wind blowing out of the north or east, there is a possibility that odours from the emptied lagoon ponds and sludge may create a nuisance to nearby residences.

Odours from the movement and storage of the sludge are not anticipated to impact human health; however, lagoon odours caused by hydrogen sulfide can pose an annoyance to people, and can create headaches, nausea, and skin and eye irritation if in sufficient concentrations under ideal conditions.

Description of Potential Impact 1: Odours

The draining and excavation of the ponds, and the management of the sludge may create a temporary odour nuisance to nearby residential receptors. Given that the odours are not anticipated to be in significant concentration or in a confined space, health effects are not anticipated.

Recommended Mitigation 1:

- Excavation/removal of the sludge will be completed as quickly as possible;
- Sludge will be maintained in the ponds and covered with water to avoid creating odours;
- During periods where sludge is outside of either pond, it will be covered with an odour-reducing, biodegradable compound, such as calcium carbonate (lime) or other product;
- The sludge will be capped with a mulch and seed mixture to form a flexible but stable ~15mm mat;
- Where possible, the timing of the removal and storage of the sludge will avoid holidays or long weekends, i.e. periods of an influx of tourism to the area, and
- Public notices will be sent to advise nearby, potentially-affected residences prior to the work taking place.

Significance of Potential Impacts

Given the temporary nature of the project and the proposed mitigation, adverse impacts to air quality are considered

4.7 GROUNDWATER QUALITY

No domestic wells are located downgradient of the subject site, and the nearest water well is approximately 300m northeast of the site. Residences located adjacent to the site are connected to municipal water and wastewater services.

Project-VEC Interactions, Potential Environmental Effects:

Monitoring wells are installed and monitored on site (refer to Appendix A) to monitor groundwater impacts in the area. Based on groundwater levels, the clay liner is suspected of leaking. Although there are no domestic wells within 300m, bacteria levels in the groundwater may be impacted in proximity to the lagoon.

Description of Potential Impact 1: Groundwater

The existing clay liner is suspected of contributing bacteria-laden water to the groundwater table, thereby elevating bacteria levels, and potentially other parameters, near the subject site.

Recommended Mitigation:

The municipality has installed a series of groundwater monitoring wells with piezometers within the subject site, to monitor water levels in the ground and indicate leaks from the current system (refer to Appendix A for a detailed diagram). This system of monitoring wells will be maintained after construction to monitor the efficacy (i.e. detect leaks) of the new HDPE liner system.

The proposed elevation of the proposed lagoon bottom will be higher than the existing ditch and a floor drainage system will be constructed, mainly for construction purposes, but will remain in place after construction.

Significance of Potential Impacts
Given the lack of downstream residential receptors, the implementation of a certified contractor-installed HDPE liner, and the lack of down-gradient domestic water wells, potential impacts are considered not significant.

4.8 SURFACE WATER QUALITY

The site is located on a peninsula formed by the Little Tracadie River, located ~300m to the west, and Tracadie Bay located 140m to the east.

Project-VEC Interactions, Potential Environmental Effects:

The proposed project requires the excavation and storage of soils and sludge within the project footprint. The current site contains perimeter ditches that convey surface water from outside the lagoon ponds towards the Tracadie Bay.

Description of Potential Impact 1: Surface Water Quality

During construction, precipitation events may cause erosion of exposed soils; sediment and waste contaminants to migrate off site and into Tracadie Bay, thereby adversely impacting water quality.

Recommended Mitigation 1:

- All exposed areas will be temporarily stabilized during construction to prevent erosion and sediment migration;
- Standard sediment controls such as silt fencing and hay bales, will be installed at various locations throughout the site within the existing surface runoff management system, at strategic locations to prevent sediment from migrating off site;
- Erosion and sediment controls will be visually surveyed regularly, and during and immediately after heavy precipitation events;
- Erosion and sediment controls will be maintained and repaired as needed, and
- The sludge will be managed to avoid spills, and maintained in the lagoon ponds throughout the construction of the project

Significance of Potential Impacts:
Given the nature of the site, the temporary nature of the project, and the proposed mitigation, potential adverse environmental impacts to surface water quality are considered unlikely and not significant.

4.9 ARCHAEOLOGICAL AND HERITAGE RESOURCES

Based on information provided by the NB Archaeological Services Unit (ASU), there are three (3) nearby sites of known archaeological resources.

Project-VEC Interactions, Potential Environmental Effects:

The eastern-most portion of the project footprint, which includes excavation within the Existing East Pond, will be partially located within the 200m buffer of a known archaeological site identified by the ASU.

Description of Potential Impact 1: Archaeological Resources

Any excavation within 200m of a known archaeological site has a higher potential to disturb or destroy an archaeological resource; however, the existing lagoon was excavated to bedrock when it was constructed in 1984. As such, potential impacts to archaeological resources within the existing footprint are considered unlikely.

Recommended Mitigation:

- Prior to initiating any work within the 200m buffer, the proponent will obtain a permit from the ASU and adhere to all conditions therein;
- During excavation of the project, in the event that a suspected archaeological resource is discovered, all work will immediately cease and the ASU will be contacted for further instructions.

Significance of Potential Impacts:

The proposed lagoon upgrades will take place within the footprint of the existing WWTP lagoon; as such, excavation of an archaeological resource is considered unlikely, and therefore not significant.

5. ACCIDENTS AND UNPLANNED EVENTS

The Regional Municipality of Tracadie will adhere to all WorkSafe NB and other applicable health, safety and environmental legislation to ensure the construction and installation of the proposed upgrades are completed in an environmentally responsible and safe manner.

Only licensed, insured and qualified contractors will be employed for the construction and commissioning of the project, under the supervision of Roy Consultants and Tracadie employees.

No temporary fuel storage will be required at the proposed project site. Nevertheless, fuel and/or hydraulic leaks may occur on site. The environmental and human health effects of such accidents, malfunctions and unplanned situations were considered as part of this assessment.

Petroleum products spills and/or leaks mostly associated with machinery and vehicles operating during construction or operation of the project could impact soil and water quality.

Petroleum products or any other deleterious substances will not be dumped on the ground or in the water, or handled or stored in a careless manner.

All necessary precautions will be taken to avoid spills and contamination to the soil and water when handling petroleum products on site and during fuelling and servicing of vehicles and equipment. Vehicles and equipment will be maintained in good working order to prevent leaks on site.

Appropriate emergency spill response equipment will be maintained on site.

All spills or leaks will be promptly contained, cleaned-up and reported to regulatory authorities. Employees will be briefed in the use of spill kits and appropriate emergency reporting procedures.

Should contaminated soils be encountered during construction activities, they will be managed in accordance with applicable federal and/or provincial requirements (i.e. New Brunswick *Guideline for the Management of Contaminated Sites* (July 2012)).

Vehicles and equipment will be maintained in good working order to prevent leaks on site.

Municipal employees and all contractors working on site will be required to maintain and wear personal protective equipment (PPE) at all times on site.

All required health and safety equipment will be kept on site and in good working order, including a First Aid kit and any other necessary health and safety equipment.

Only employees properly skilled and trained shall be employed in the construction, operation and maintenance of the project. All appropriate employee certification shall be maintained in good standing.

All workers on site shall be properly trained and insured as per the requirements of WorkSafe NB and the Occupational Health and Safety Act (OHSA).

All accidents shall be reported to WorkSafe NB and where necessary, protocols developed to avoid future, similar occurrences.

6. CUMULATIVE EFFECTS

The construction of the proposed project is anticipated to be a temporary project with minimal adverse environmental effects. The operation of the upgraded WWTP, when completed, will result in increased treatment efficiency and therefore, improved effluent quality.

Based on the minimal potential adverse environmental impacts, the minimal/existing project footprint, and the anticipated benefits of the project, no cumulative effects assessment was conducted for this project.

7. PUBLIC INVOLVEMENT

The public involvement activities proposed for this project registration will be conducted as per the requirements of Appendix C of the *Guide to Environmental Impact Assessment in New Brunswick (2012)*. The public involvement strategy will be submitted separately to the DELG Project Manager for approval, and a summary report outlining the strategy and its results will be submitted for review within 60 days of the date of registration.

8. FIRST NATIONS

The proposed project is located on municipal-owned land and will be funded by the proponent. The nearest First Nation, Esgenoopetitj First Nation, is located approximately 35 km south of the subject site. Pabineau First Nation is located approximately 55km west of the site.

Based on the ownership and current use of the site, the lack of footprint expansion, and the anticipated benefits from the improved effluent quality, it is not anticipated that the proposed project will infringe on Aboriginal Rights or traditional land use by a First Nation.

However, due to the existence of the known, pre-contact archaeological sites, the above-noted First Nations will be informed of the project and asked to provide their feedback in writing, as part of the public involvement process.

9. APPROVAL OF THE UNDERTAKING

The following permits, approvals and authorizations are anticipated for the project to include but not be limited to:

Provincial

a) Certificate of Determination – DELG
b) Approval to Construct and Operate – DELG

Federal

No federal approval or authorization is anticipated for this project.

10. FUNDING

The proposed project is a "P3" program, jointly funded by the federal, provincial and municipal governments under the Clean Water and Wastewater Fund.

11. CLOSING STATEMENT

This environmental impact assessment identified Valued Environmental Components which may potentially be impacted by the proposed WWTP upgrades, and identified potential adverse effects which may occur from the development of the project. Significance was determined based on four criteria: *likelihood*, *scale*, *duration* and proposed *mitigation*.

All VECs were assessed and identified as either not impacted by the project, or the impacts were considered not significant based on the above criteria.

This project also involves significantly altering an important staging area for migrating waterfowl, including some bird Species at Risk, during the fall migration period. As the proposed project is in the public good, will improve downstream water quality by improving the WWTP effluent quality, will be temporary in nature, and mitigation measures are proposed to reduce the risk of impacting nesting birds, the risk to migratory birds is considered acceptable.

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APPENDIX A:
Large Site Diagrams

ROY CONSULTANTS
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548, av. King Ave.
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T. 506.546.4484
www.royconsultants.ca

No.	date	revisions	by/par
A	17/04/10	FOR APPROVAL	R.T.

project/projet	AMÉLIORATION LAGUNE SECTEUR TRACADIE		title/titre: OVERALL PLAN
design by/design par: B. COMEAU	check by/verifie par		
scale/echelle: 1:4000	date: FÉVRIER 2017	drawn by/dessine par: R. THIBODEAU	No.: 047-17-ENV-SK1
			rev.: A

RUE DE LA BLOCK STREET

RUE DE LA CHAPELLE STREET

LEGEND

10 SEQUENCE OF CONSTRUCTION

PROPOSED BLOWER BUILDING & UV SYSTEM

ABANDONNED CHLORINATION BUILDING

EXISTING BLOWER BUILDING

LAY DOWN AREA

PROPOSED SILT FENCE

PROPOSED POND #1

EXISTING WEST POND

EXISTING EAST POND

PROPOSED POND #2

SLUDGE POND #2

SLUDGE POND #1

PROPOSED SEDIMENT CONTROL STRUCTURE

BAIE DE TRACADIE

A DETAIL No
No DU DETAIL
B LOCATION DRAWING No
SUR DESSIN No
C DRAWING No
DESSIN No

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No.	date	revisions	by/par
A	17/04/10	FOR APPROVAL	R.T.

project/projet: AMÉLIORATION DE LA LAGUNE SECTEUR TRACADIE

design by/design par: B. COMEAU

check by/verifie par:

scale/echelle: 1:2000

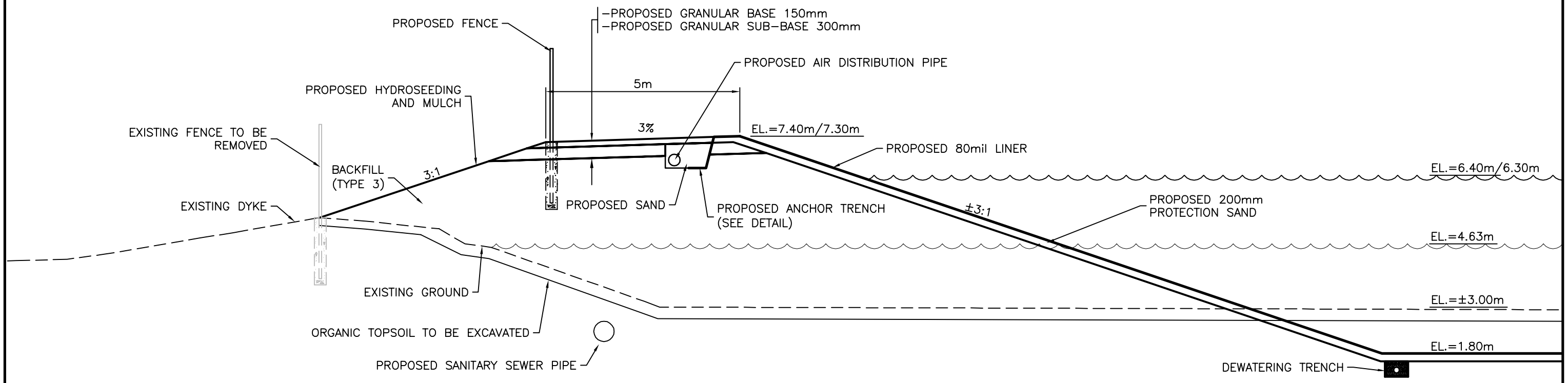
date: APRIL 2017

drawn by/dessine par: R. THIBODEAU

title/titre: SEQUENCE OF OPERATION

No.: 047-17-ENV-SK2

rev.: A



SECTION – PROPOSED BERM

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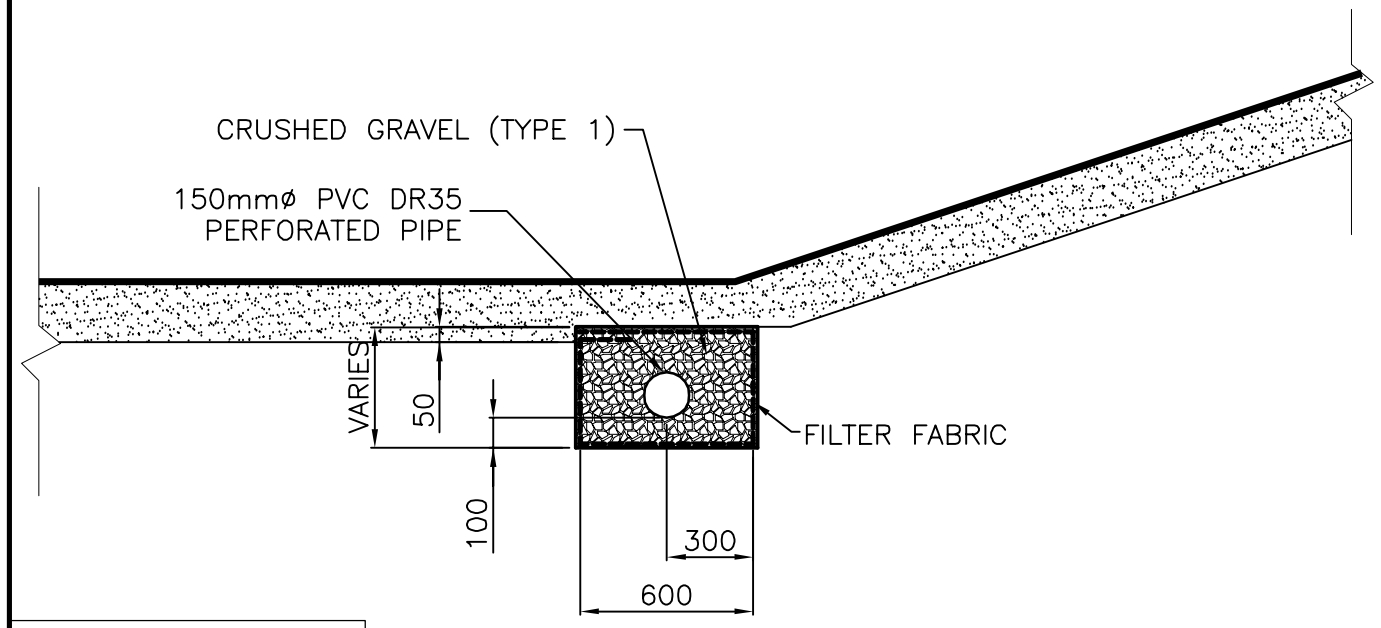

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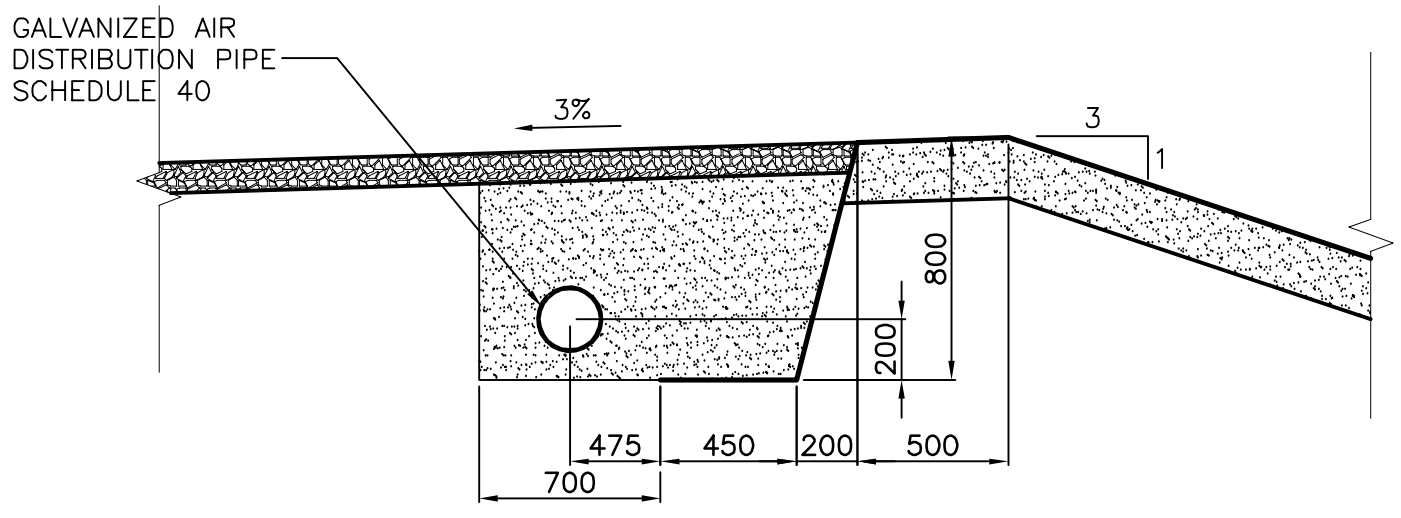
No DU DETAIL
B LOCATION DRAWING No
SUR DESSIN No
C DRAWING No
DESSIN No

DEWATERING TRENCH DETAIL

1:25



ANCHOR TRENCH AND MAIN AIR PIPE DETAIL

1:25

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A	17/04/11	ISSUED FOR APPROBATION	R.T.

project/projet	AMÉLIORATION DE LA LAGUNE SECTEUR TRACADIE		title/titre: BERM SECTION & DETAILS
design by/design par: B. COMEAU		check by/verifie par	
scale/echelle: TEL QU'INDIQUÉ	date: AVRIL 2017	drawn by/dessine par: R. THIBODEAU	No.: 047–17–ENV–SK3
			rev.: A

RUE DE LA BLOCK STREET

BH#1 (ELEV. 5.88m)
WATER TABLE
–JAN. 30, 2017: 3.44m
–APRIL 12, 2017: 3.24m
–APRIL 19, 2017: 3.17m

BH#2 (ELEV. 4.88m)
WATER TABLE
–JAN 31, 2017: 2.44m

NOTE: BH#1, 5 ,10 AND 12
HAVE PIEZOMETERS.

BH#7 (ELEV. 5.87m)
WATER TABLE
–FEB. 1, 2017: 4.35m
–APRIL 12, 2017: 3.07m
–APRIL 19, 2017: 3.03m

BH#12 (ELEV. 5.33m)
WATER TABLE
–FEB. 2, 2017: 4.41m

BH#11 (ELEV. 5.31m)
WATER TABLE
–FEB. 2, 2017: 3.48m

BH#6 (ELEV. 4.05m)
WATER TABLE
–FEB. 1, 2017: 2.15m

BH#3 (ELEV. 5.66m)
WATER TABLE
–JAN. 31, 2017: 3.22m

EXISTING WEST POND

EXISTING EAST POND

BH#10 (ELEV. 5.32)
WATER TABLE
–FEB. 2, 2017: 4.41m
–APRIL 12, 2017: 4.83m
–APRIL 19, 2017: 4.92m

BH#5 (ELEV. 4.33m)
WATER TABLE
–FEB. 1, 2017: 2.35m
–APRIL 12, 2017: 2.19m
–APRIL 19, 2017: 2.13m

BH#4 (ELEV. 6.05m)
WATER TABLE
–JAN. 31, 2017: 3.15m

BH#8 (ELEV. 5.35m)
WATER TABLE
–FEB. 2, 2017: 3.22m

BH#9 (ELEV. 5.24m)
WATER TABLE
–FEB. 2, 2017: 3.87m

RUE DE LA CHAPELLE STREET

BAIE DE TRACADIE

A DETAIL No
No DU DETAIL
B LOCATION DRAWING No
SUR DESSIN No
C DRAWING No
DESSIN No

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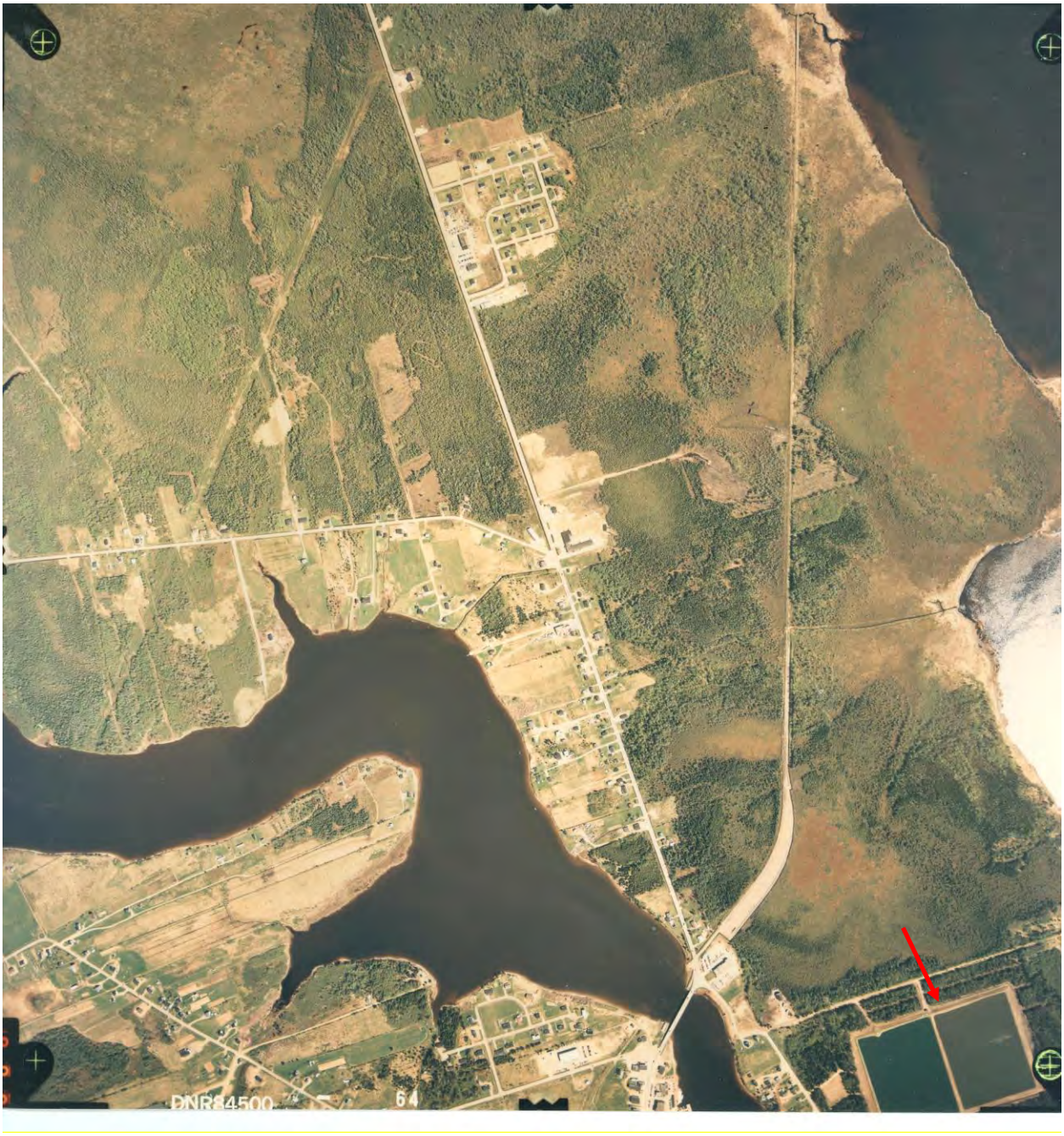
No.	date	revisions	by/par
A	17/04/10	FOR APPROVAL	R.T.

project/projet	AMÉLIORATION DE LA LAGUNE SECTEUR TRACADIE		title/titre: BOREHOLE AND WATER TABLE
design by/design par: B. COMEAU		check by/verifie par	
scale/echelle: 1:2000	date: APRIL 2017	drawn by/dessine par: R. THIBODEAU	No.: 047–17–ENV–SK4
			rev.: A

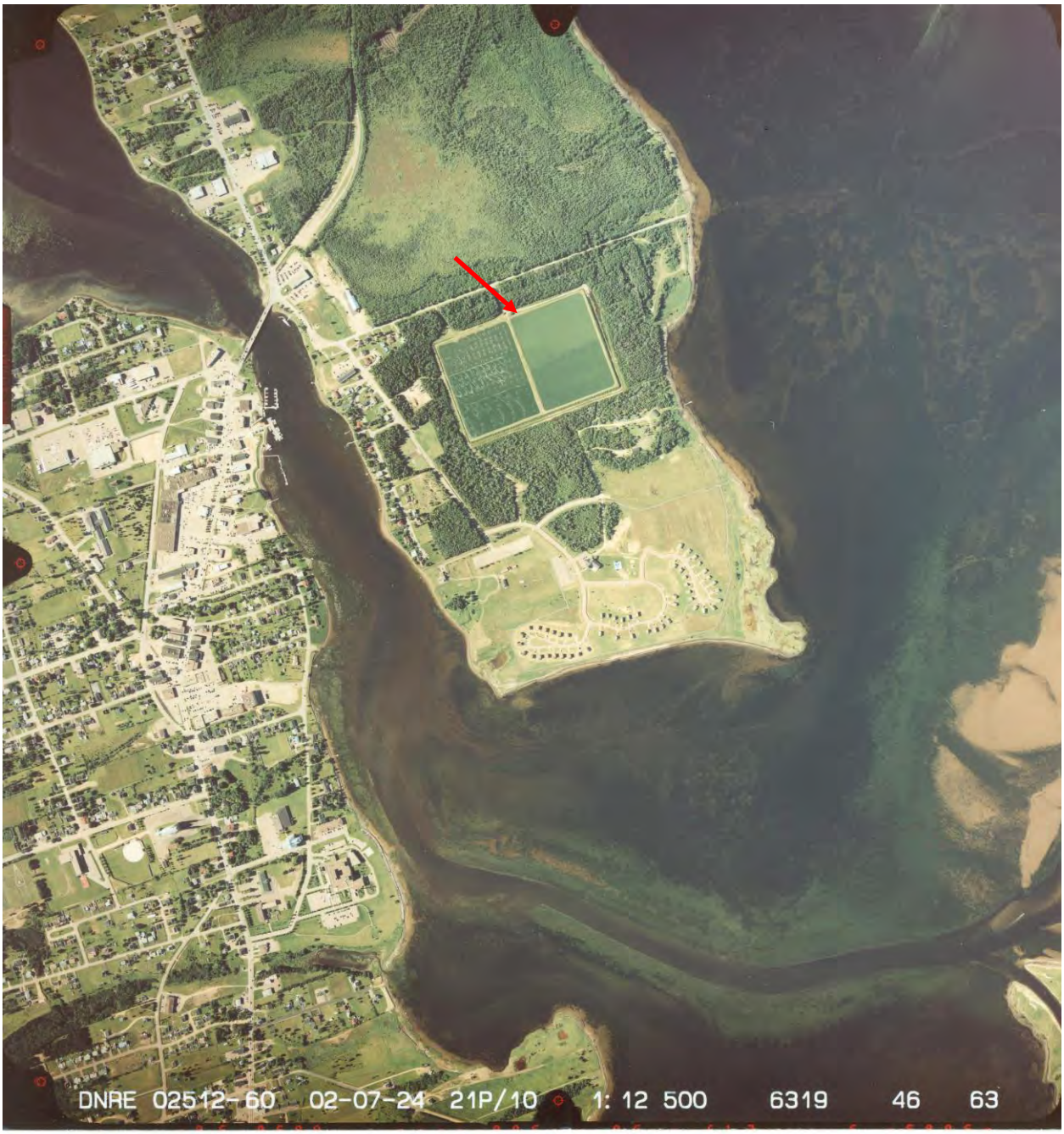
APPENDIX B:
Aerial Photos

Aerial Photo 1: 1963 DNR aerial photo 1963-6343-60 (subject site indicated by red arrow).

Aerial Photo 2: 1974 DNR aerial photo 1974-513-204.



Aerial Photo 3: 1984 DNR aerial photo 1984-500-64.



Aerial Photo 4: 2002 DNR aerial photo 2002-512-059.

Aerial Photo 5: 2012 DNR aerial photo 2012-510-133-0600.

APPENDIX C:

Atlantic Canada Conservation Data Centre Report

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

DATA REPORT 5801: Kings Mines, NB

Prepared 19 March 2017
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
KingsMinesNB_5801ob.xls	All Rare and legally protected *Flora and Fauna* within 5 km of your study area
KingsMinesNB_5801ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
KingsMinesNB_5801sa.xls	All *Significant Natural Areas* in your study area
KingsMinesNB_5801ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)
KingsMinesNB_5801bc.xls	Rare and common *Colonial Birds* 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) 364-2657
jrbreau@mta.ca

Questions on the biology of Federal Species at Risk can be directed to ACCDC: (506) 364-2658, 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
Duncan.Bayne@novascotia.ca

Western: Donald Sam
(902) 634-7525
Donald.Sam@novascotia.ca

Central: Shavonne Meyer
(902) 893-6353
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(902) 893-5630
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Eastern: Mark Pulsifer
(902) 863-7523
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Eastern: Donald Anderson
(902) 295-3949
Donald.Anderson@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

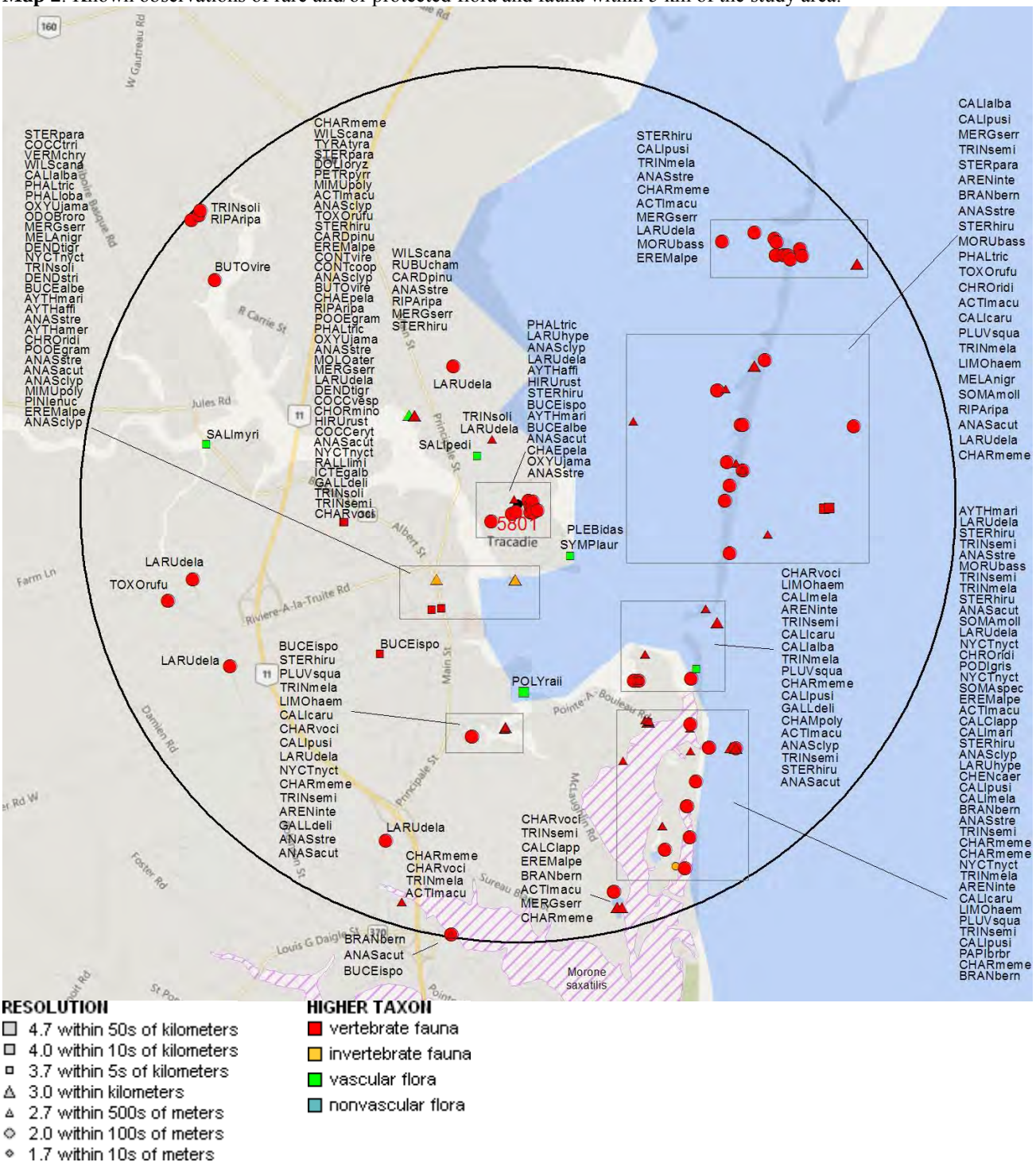
2.1 FLORA

A 5 km buffer around the study area contains 8 records of 6 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 777 records of 67 vertebrate, 4 records of 4 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

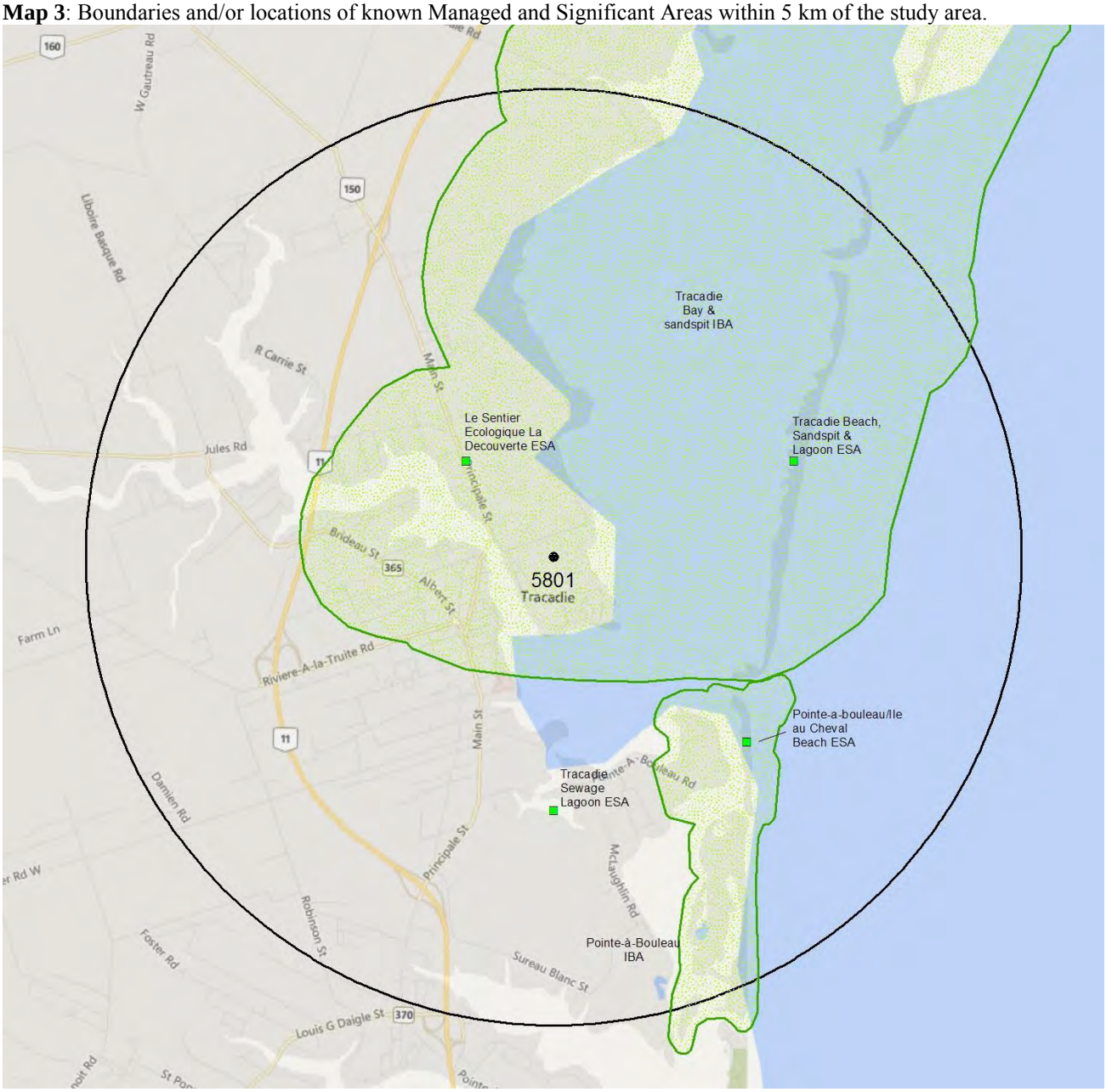
3.1 MANAGED AREAS

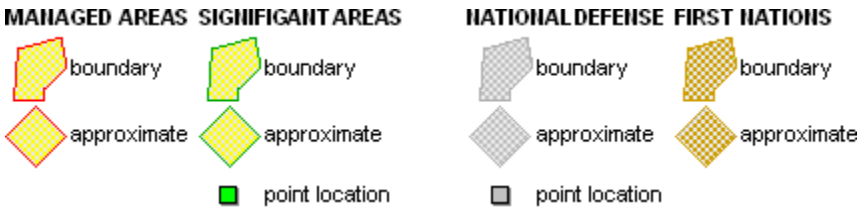
The GIS scan identified no managed areas in the vicinity of the study area (Map 3)

3.2 SIGNIFICANT AREAS

The GIS scan identified 6 biologically significant sites 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 (excluding "location-sensitive" species, section 4.3) 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 (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	2	0.8 ± 5.0
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	2	2.8 ± 5.0
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	1	3.6 ± 5.0
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	1	0.7 ± 5.0
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	1	1.6 ± 1.0
P	*Polygonum raii*	Sharp-fruited Knotweed				SH	0.1 Extirpated	1	2.2 ± 10.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	138	2.0 ± 7.0
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	16	2.3 ± 0.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	2	0.1 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	9	1.6 ± 1.0
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	6	0.1 ± 0.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	5	2.0 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	3	2.0 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	1	2.0 ± 7.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	4	0.9 ± 1.0
A	*Vermivora chrysoptera*	Golden-winged Warbler	Threatened	Threatened		SNA	8 Accidental	1	0.9 ± 1.0
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	8	0.1 ± 0.0
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	1	0.9 ± 1.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	4	2.0 ± 7.0
A	*Odobenus rosmarus rosmarus*	Atlantic Walrus	Special Concern		Extirpated	SX		1	0.9 ± 1.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	44	0.1 ± 0.0
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	1	3.7 ± 1.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	33	2.3 ± 0.0
A	*Aythya americana*	Redhead				S1B,S1M	8 Accidental	1	0.9 ± 1.0
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	7	0.1 ± 0.0
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	4 Secure	5	0.1 ± 0.0
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	11	0.1 ± 0.0
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	4 Secure	7	0.1 ± 0.0
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	6	1.6 ± 7.0
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	2 May Be At Risk	4	1.6 ± 7.0
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	17	2.7 ± 1.0
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3 Sensitive	3	0.9 ± 1.0
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	3 Sensitive	2	2.0 ± 7.0
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	7	0.9 ± 1.0
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	4	1.6 ± 7.0
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	3 Sensitive	5	2.0 ± 7.0
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	2 May Be At Risk	5	1.5 ± 7.0
A	*Anas strepera*	Gadwall				S2B,S3M	4 Secure	23	0.1 ± 0.0
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	1	1.6 ± 7.0
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	9	0.8 ± 0.0
A	*Chen caerulescens*	Snow Goose				S2M	4 Secure	1	3.7 ± 1.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Somateria spectabilis*	King Eider				S2N,S2M	4 Secure	1	3.7 ± 1.0
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	4 Secure	2	0.1 ± 0.0
A	*Anas clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	28	0.1 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	1	2.0 ± 7.0
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	3 Sensitive	2	3.7 ± 1.0
A	*Carduelis pinus*	Pine Siskin				S3	4 Secure	5	1.6 ± 1.0
A	*Rallus limicola*	Virginia Rail				S3B,S3M	3 Sensitive	1	2.0 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	18	2.0 ± 7.0
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	28	2.0 ± 7.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	1	2.0 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	6	2.0 ± 7.0
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	2	2.0 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	3	2.0 ± 7.0
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	9	2.7 ± 1.0
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	4	0.9 ± 1.0
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	43	0.1 ± 0.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	16	0.9 ± 1.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	24	2.3 ± 0.0
A	*Melanitta nigra*	Black Scoter				S3M,S1S2N	3 Sensitive	5	0.9 ± 1.0
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	2	0.1 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	1	3.7 ± 1.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	5	2.0 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	31	2.0 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	6	2.0 ± 7.0
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	47	0.1 ± 0.0
A	*Dendroica striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	1	0.9 ± 1.0
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	23	2.3 ± 0.0
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	19	2.3 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	26	2.3 ± 0.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	2	2.3 ± 0.0
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	12	0.9 ± 1.0
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	8	2.9 ± 0.0
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	4 Secure	1	4.5 ± 0.0
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	4 Secure	1	4.5 ± 0.0
I	*Plebejus idas*	Northern Blue				S3	4 Secure	1	0.9 ± 1.0
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				SH	2 May Be At Risk	1	1.3 ± 1.0

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?
Chrysemys picta picta	Eastern Painted Turtle			No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat Hibernaculum		[Endangered][1]	[Endangered][1]	No

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

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.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 17716 records of 117 vertebrate and 437 records of 43 invertebrate fauna; 4244 records of 233 vascular, 100 records of 58 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs. All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are 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 (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	6	80.6 ± 1.0	NB
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	1	87.1 ± 0.0	PE
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	2569	2.0 ± 7.0	NB
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	33.9 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	483	2.3 ± 0.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	2	22.3 ± 1.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened		Threatened	S1B,S1M	2 May Be At Risk	5	38.7 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened		Threatened	S1S2B,S1S2M	2 May Be At Risk	27	18.2 ± 7.0	NB
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	37	12.4 ± 0.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	3	50.8 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	274	35.9 ± 1.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	122	0.1 ± 0.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	426	1.6 ± 1.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	418	0.1 ± 0.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	478	2.0 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	150	2.0 ± 7.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	181	2.0 ± 7.0	NB
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	233	0.9 ± 1.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	4 Secure	7	56.0 ± 1.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	5	10.2 ± 1.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	9	13.6 ± 2.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	20	8.2 ± 1.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	36	0.1 ± 0.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	61	17.6 ± 0.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	6	0.9 ± 1.0	NB
A	*Phocoena phocoena (NW Atlantic pop.)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		2	25.6 ± 5.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	223	2.0 ± 7.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	2	11.7 ± 3.0	NB
A	*Odobenus rosmarus rosmarus*	Atlantic Walrus	Special Concern		Extirpated	SX		6	0.9 ± 1.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	14	6.3 ± 1.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	5	12.7 ± 7.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	10	21.3 ± 0.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	8	19.9 ± 7.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	5	76.8 ± 0.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		1	40.7 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	26	21.9 ± 1.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	604	0.1 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	6	3.7 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	282	0.1 ± 0.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient		Endangered	SU	5 Undetermined	32	27.3 ± 1.0	NB
A	*Morone saxatilis*	Striped Bass	E,E,SC			S3	2 May Be At Risk	13	10.9 ± 10.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	809	2.3 ± 0.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	3 Sensitive	7	8.5 ± 1.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	19	0.1 ± 0.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	3 Sensitive	1	77.7 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	2 May Be At Risk	2	80.6 ± 10.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	4 Secure	11	0.1 ± 0.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	4 Secure	6	15.7 ± 0.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	38	0.1 ± 0.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	4 Secure	21	0.1 ± 0.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	127	1.6 ± 7.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	2 May Be At Risk	35	1.6 ± 7.0	NB
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	65	2.7 ± 1.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3 Sensitive	6	0.9 ± 1.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	3 Sensitive	2	2.0 ± 7.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	245	0.9 ± 1.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	17	12.0 ± 7.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	3	38.7 ± 0.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	5 Undetermined	4	7.2 ± 0.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	24	33.1 ± 1.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	3 Sensitive	27	14.5 ± 0.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	61	1.6 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	3 Sensitive	26	2.0 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	2 May Be At Risk	58	1.5 ± 7.0	NB
A	*Anas strepera*	Gadwall				S2B,S3M	4 Secure	68	0.1 ± 0.0	NB
A	*Alca torda*	Razorbill				S2B,S3N,S3M	4 Secure	7	37.0 ± 7.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	20	1.6 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	70	0.8 ± 0.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S2B,SUM	3 Sensitive	1	40.3 ± 0.0	NB
A	*Chen caerulescens*	Snow Goose				S2M	4 Secure	5	3.7 ± 1.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	4 Secure	38	25.7 ± 1.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	4 Secure	2	3.7 ± 1.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	4 Secure	18	0.1 ± 0.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	11	19.9 ± 7.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	3 Sensitive	13	17.2 ± 1.0	NB
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	118	17.5 ± 1.0	NB
A	*Anas clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	64	0.1 ± 0.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	14	51.7 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	223	2.0 ± 7.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	3 Sensitive	97	14.5 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	3 Sensitive	8	3.7 ± 1.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	55	13.6 ± 3.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	52	23.3 ± 7.0	NB
A	*Carduelis pinus*	Pine Siskin				S3	4 Secure	157	1.6 ± 1.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	4 Secure	39	51.1 ± 0.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	8	6.7 ± 0.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	3 Sensitive	15	2.0 ± 7.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	698	2.0 ± 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	402	2.0 ± 7.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	62	2.0 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	4 Secure	50	10.0 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	4 Secure	19	15.5 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	4 Secure	14	7.1 ± 1.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	138	2.0 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	49	2.0 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	193	2.0 ± 7.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	141	2.7 ± 1.0	NB
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	145	0.9 ± 1.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	211	0.1 ± 0.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	278	0.9 ± 1.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	752	2.3 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	3	21.2 ± 0.0	NB
A	*Melanitta nigra*	Black Scoter				S3M,S1S2N	3 Sensitive	144	0.9 ± 1.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	27	0.1 ± 0.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	19	3.7 ± 1.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	12	60.5 ± 0.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	184	2.0 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	993	2.0 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	289	2.0 ± 7.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	381	0.1 ± 0.0	NB
A	*Dendroica striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	59	0.9 ± 1.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	667	2.3 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	358	2.3 ± 0.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	944	2.3 ± 0.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	165	2.3 ± 0.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	573	0.9 ± 1.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	227	2.9 ± 0.0	NB
I	*Coenonympha nipisiquit*	Maritime Ringlet	Endangered	Endangered	Endangered	S1	1 At Risk	62	45.9 ± 20.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	12	91.2 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	10	41.1 ± 0.0	NB
I	*Danaus plexippus*	Monarch	Special Concern	Special Concern	Special Concern	S3B,S3M	3 Sensitive	10	50.8 ± 0.0	NB
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	8	38.0 ± 1.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	4 Secure	17	23.0 ± 1.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	7	28.3 ± 0.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	3	80.4 ± 0.0	NB
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	1	92.6 ± 0.0	NB
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	3 Sensitive	6	56.0 ± 1.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	4 Secure	4	45.1 ± 1.0	NB
I	*Calathus gregarius*	a Ground Beetle				S3	4 Secure	1	64.1 ± 1.0	NB
I	*Carabus maeander*	a Ground Beetle				S3	5 Undetermined	1	28.3 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	4 Secure	1	77.0 ± 1.0	NB
I	*Hyperaspis disconotata*	a Ladybird Beetle				S3	5 Undetermined	1	75.0 ± 5.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	1	82.5 ± 5.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	2	46.7 ± 10.0	NB
I	*Papilio brevicauda*	Short-tailed Swallowtail				S3	4 Secure	39	15.9 ± 1.0	NB
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	4 Secure	12	4.5 ± 0.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	3	59.7 ± 0.0	NB

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I	*Lycaena dospassosi*	Salt Marsh Copper				S3	4 Secure	106	4.5 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	2	55.6 ± 0.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	4	28.7 ± 0.0	NB
I	*Callophrys eryphon*	Western Pine Elfin				S3	4 Secure	3	45.1 ± 1.0	NB
I	*Plebejus idas*	Northern Blue				S3	4 Secure	26	0.9 ± 1.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	4 Secure	12	28.0 ± 10.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	3	35.6 ± 1.0	NB
I	*Boloria eunomia*	Bog Fritillary				S3	5 Undetermined	5	47.5 ± 2.0	NB
I	*Boloria chariclea*	Arctic Fritillary				S3	4 Secure	4	44.4 ± 1.0	NB
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S3	4 Secure	4	45.2 ± 10.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	8	74.9 ± 0.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	11	44.6 ± 0.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	4 Secure	1	92.7 ± 10.0	NB
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	4 Secure	2	93.8 ± 0.0	NB
I	*Somatochlora albicincta*	Ringed Emerald				S3	4 Secure	1	87.4 ± 1.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	2	45.5 ± 0.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	7	23.4 ± 1.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	4 Secure	1	91.9 ± 0.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	10	46.4 ± 1.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	3 Sensitive	1	85.4 ± 1.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	4 Secure	10	27.6 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	3	45.4 ± 1.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				SH	2 May Be At Risk	10	1.3 ± 1.0	NB
N	*Aulacomnium heterostichum*	One-sided Groove Moss				S1	2 May Be At Risk	1	77.2 ± 0.0	NB
N	*Campylostelium saxicola*	a Moss				S1	2 May Be At Risk	1	74.8 ± 0.0	NB
N	*Zygodon viridissimus var. viridissimus*	a Moss				S1	2 May Be At Risk	1	76.8 ± 0.0	NB
N	*Bryum blindii*	a Moss				S1?	2 May Be At Risk	1	93.3 ± 1.0	NB
N	*Cinclidium stygium*	Sooty Cupola Moss				S1?	2 May Be At Risk	1	70.0 ± 0.0	NB
N	*Tortula cernua*	Narrow-Leafed Chain-Teeth Moss				S1?	2 May Be At Risk	1	93.3 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	50.9 ± 1.0	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	1	77.0 ± 0.0	NB
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	2 May Be At Risk	1	70.0 ± 0.0	NB
N	*Rhizomnium pseudopunctatum*	Felted Leafy Moss				S1?	2 May Be At Risk	1	78.3 ± 0.0	NB
N	*Odontoschisma sphagni*	Bog-Moss Flapwort				S1S2	6 Not Assessed	1	65.8 ± 0.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	2 May Be At Risk	1	93.3 ± 1.0	NB
N	*Drummondia prorepens*	a Moss				S1S2	2 May Be At Risk	1	74.6 ± 0.0	NB
N	*Seligeria brevifolia*	a Moss				S1S2	3 Sensitive	4	77.1 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	6 Not Assessed	1	9.9 ± 1.0	NB
N	*Cephalozia connivens*	Forcipated Pincerwort				S1S3	6 Not Assessed	1	55.7 ± 10.0	NB
N	*Lophozia badensis*	Dwarf Notchwort				S1S3	6 Not Assessed	1	93.3 ± 1.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2 May Be At Risk	1	43.1 ± 10.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	3 Sensitive	4	74.6 ± 0.0	NB
N	*Pohlia sphagnicola*	a moss				S2	3 Sensitive	1	79.9 ± 0.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	1	47.9 ± 0.0	NB
N	*Tetrodontium*	Little Georgia				S2	3 Sensitive	5	74.6 ± 0.0	NB

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	brownianum									
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	3 Sensitive	1	93.3 ± 1.0	NB
N	*Anomobryum filiforme*	a moss				S2	5 Undetermined	1	93.3 ± 1.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	2 May Be At Risk	1	82.1 ± 0.0	NB
N	*Anacamptodon splachnoides*	a Moss				S2?	3 Sensitive	1	99.1 ± 1.0	NB
N	*Bryum pallescens*	Pale Bryum Moss				S2?	5 Undetermined	1	98.7 ± 100.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	3 Sensitive	1	70.9 ± 0.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	1	77.4 ± 0.0	NB
N	*Bryum uliginosum*	a Moss				S2S3	3 Sensitive	1	88.0 ± 9.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2S3	5 Undetermined	5	77.0 ± 0.0	NB
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	3 Sensitive	8	74.6 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	3 Sensitive	2	70.0 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	2 May Be At Risk	2	79.9 ± 0.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	2 May Be At Risk	1	77.0 ± 0.0	NB
N	*Dendriscocaulon umhausense*	a lichen				S2S3	3 Sensitive	1	74.4 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	4 Secure	1	78.3 ± 0.0	NB
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	3 Sensitive	1	74.4 ± 0.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	5 Undetermined	1	79.4 ± 0.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	4 Secure	4	77.1 ± 0.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5 Undetermined	1	9.4 ± 7.0	NB
N	*Dicranella varia*	a Moss				S3S4	4 Secure	1	88.0 ± 9.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	4 Secure	4	77.3 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	1	51.4 ± 10.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	4 Secure	1	88.0 ± 9.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	4 Secure	2	77.1 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	4 Secure	1	74.7 ± 0.0	NB
N	*Sphagnum compactum*	Compact Peat Moss				S3S4	4 Secure	1	74.9 ± 1.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	4 Secure	1	94.0 ± 0.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	4 Secure	1	94.0 ± 0.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	4 Secure	2	80.0 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	77.1 ± 0.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	4 Secure	1	88.0 ± 9.0	NB
N	*Rauiella scita*	Smaller Fern Moss				S3S4	3 Sensitive	1	82.7 ± 0.0	NB
N	*Pseudocyphellaria perpetua*	Gilded Specklebelly Lichen				S3S4	3 Sensitive	4	76.9 ± 0.0	NB
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	5 Undetermined	1	70.9 ± 1.0	NB
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	9	74.4 ± 0.0	NB
N	*Splachnum luteum*	Yellow Collar Moss				SH	5 Undetermined	1	98.7 ± 100.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	3	81.1 ± 0.0	NB
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	32	0.8 ± 5.0	NB
P	*Symphyotrichum subulatum (Bathurst pop)*	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	203	45.3 ± 0.0	NB
P	*Lechea maritima var. subcylindrica*	Beach Pinweed	Special Concern			S2	3 Sensitive	397	39.5 ± 0.0	NB
P	*Eriocaulon parkeri*	Parker's Pipewort	Not At Risk		Endangered	S2	1 At Risk	82	83.9 ± 1.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	1 At Risk	1	95.8 ± 0.0	NB
P	*Bidens eatonii*	Eaton's Beggarticks				S1	2 May Be At Risk	7	85.7 ± 0.0	NB

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P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2 May Be At Risk	1	42.6 ± 0.0	NB
P	*Betula michauxii*	Michaux's Dwarf Birch				S1	2 May Be At Risk	3	59.7 ± 0.0	NB
P	*Cynoglossum virginianum var. boreale*	Wild Comfrey				S1	2 May Be At Risk	1	90.0 ± 0.0	NB
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S1	2 May Be At Risk	1	73.5 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	7	81.7 ± 0.0	NB
P	*Draba incana*	Twisted Whitlow-grass				S1	2 May Be At Risk	9	38.2 ± 0.0	NB
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	1	58.4 ± 10.0	NB
P	*Stellaria longipes*	Long-stalked Starwort				S1	2 May Be At Risk	17	15.8 ± 1.0	NB
P	*Triadenum virginicum*	Virginia St John's-wort				S1	2 May Be At Risk	1	82.2 ± 0.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	2 May Be At Risk	1	33.1 ± 1.0	NB
P	*Vaccinium uliginosum*	Alpine Bilberry				S1	2 May Be At Risk	5	59.0 ± 2.0	NB
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	9	2.8 ± 5.0	NB
P	*Bartonia virginica*	Yellow Bartonia				S1	2 May Be At Risk	3	50.9 ± 1.0	NB
P	*Ranunculus lapponicus*	Lapland Buttercup				S1	2 May Be At Risk	1	74.9 ± 0.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	2 May Be At Risk	3	57.4 ± 2.0	NB
P	*Salix serissima*	Autumn Willow				S1	2 May Be At Risk	4	68.2 ± 0.0	NB
P	*Agalinis paupercula var. borealis*	Small-flowered Agalinis				S1	2 May Be At Risk	1	100.0 ± 0.0	NB
P	*Carex glareosa var. amphigena*	Gravel Sedge				S1	2 May Be At Risk	3	14.2 ± 1.0	NB
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	10	33.8 ± 0.0	NB
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	11	68.2 ± 0.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	2 May Be At Risk	2	88.7 ± 0.0	NB
P	*Cyperus bipartitus*	Shining Flatsedge				S1	2 May Be At Risk	13	57.8 ± 0.0	NB
P	*Schoenoplectus smithii*	Smith's Bulrush				S1	2 May Be At Risk	18	85.9 ± 0.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	2	82.2 ± 1.0	NB
P	*Juncus stygius ssp. americanus*	Moor Rush				S1	2 May Be At Risk	1	95.1 ± 5.0	NB
P	*Zigadenus elegans ssp. glaucus*	Mountain Death Camas				S1	2 May Be At Risk	7	81.8 ± 0.0	NB
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	2	68.2 ± 0.0	NB
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	2 May Be At Risk	1	77.5 ± 0.0	NB
P	*Catabrosa aquatica var. laurentiana*	Water Whorl Grass				S1	2 May Be At Risk	5	61.9 ± 0.0	NB
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	2 May Be At Risk	3	58.4 ± 0.0	NB
P	*Puccinellia ambigua*	Dwarf Alkali Grass				S1	5 Undetermined	2	38.1 ± 0.0	NB
P	*Zizania aquatica var. brevis*	Indian Wild Rice				S1	2 May Be At Risk	16	57.8 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	2 May Be At Risk	3	86.8 ± 0.0	PE
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	2 May Be At Risk	1	70.4 ± 0.0	NB
P	*Bidens heterodoxa*	Connecticut Beggar-Ticks				S1?	2 May Be At Risk	5	33.5 ± 1.0	NB
P	*Rumex aquaticus var. fenestratus*	Western Dock				S1S2	2 May Be At Risk	1	90.4 ± 0.0	NB
P	*Carex crawei*	Crawe's Sedge				S1S2	2 May Be At Risk	1	14.0 ± 0.0	NB
P	*Thelypteris simulata*	Bog Fern				S1S2	2 May Be At Risk	1	78.5 ± 1.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	2 May Be At Risk	25	35.3 ± 1.0	NB
P	*Listera australis*	Southern Twayblade			Endangered	S2	1 At Risk	6	78.7 ± 0.0	NB
P	*Osmorhiza*	Blunt Sweet Cicely				S2	3 Sensitive	5	69.1 ± 1.0	NB

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	depauperata									
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3 Sensitive	24	98.0 ± 0.0	PE
P	*Ionactis linariifolius*	Stiff Aster				S2	3 Sensitive	42	57.3 ± 0.0	NB
P	*Symphyotrichum subulatum*	Annual Saltmarsh Aster				S2	1 At Risk	152	45.3 ± 0.0	NB
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	4	58.5 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	3 Sensitive	6	30.2 ± 5.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3 Sensitive	1	90.7 ± 5.0	PE
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	1	71.3 ± 0.0	NB
P	*Atriplex franktonii*	Frankton's Saltbush				S2	4 Secure	4	10.8 ± 1.0	NB
P	*Chenopodium rubrum*	Red Pigweed				S2	3 Sensitive	10	39.3 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	1	60.4 ± 10.0	NB
P	*Nuphar lutea ssp. rubrodisca*	Red-disked Yellow Pond-lily				S2	3 Sensitive	2	59.7 ± 0.0	NB
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S2	3 Sensitive	1	94.7 ± 0.0	NB
P	*Ranunculus longirostris*	Eastern White Water-Crowfoot				S2	5 Undetermined	1	99.1 ± 1.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	2	58.5 ± 1.0	NB
P	*Rosa acicularis ssp. sayi*	Prickly Rose				S2	2 May Be At Risk	102	57.3 ± 0.0	NB
P	*Salix candida*	Sage Willow				S2	3 Sensitive	56	16.7 ± 10.0	NB
P	*Sagittaria calycina var. spongiosa*	Long-lobed Arrowhead				S2	4 Secure	103	57.8 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	12	68.2 ± 0.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S2	3 Sensitive	3	95.1 ± 0.0	NB
P	*Carex livida var. radicaulis*	Livid Sedge				S2	3 Sensitive	5	57.5 ± 0.0	NB
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2	3 Sensitive	3	95.3 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S2	3 Sensitive	14	14.2 ± 0.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	1	61.1 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	2	8.9 ± 10.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	7	39.5 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	2 May Be At Risk	8	36.4 ± 0.0	NB
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	65	20.8 ± 2.0	NB
P	*Juncus vaseyi*	Vasey Rush				S2	3 Sensitive	39	57.0 ± 5.0	NB
P	*Amerorchis rotundifolia*	Small Round-leaved Orchis				S2	2 May Be At Risk	12	27.9 ± 3.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	2	23.2 ± 0.0	NB
P	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid				S2	2 May Be At Risk	1	82.2 ± 1.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	2	67.6 ± 5.0	NB
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S2	3 Sensitive	23	20.6 ± 5.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	1	62.8 ± 0.0	NB
P	*Agrostis mertensii*	Northern Bent Grass				S2	2 May Be At Risk	52	58.5 ± 0.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	1	67.3 ± 0.0	NB
P	*Piptatherum canadense*	Canada Rice Grass				S2	3 Sensitive	1	58.6 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	4 Secure	3	70.4 ± 0.0	NB
P	*Puccinellia laurentiana*	Nootka Alkali Grass				S2	3 Sensitive	12	45.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Puccinellia phryganodes*	Creeping Alkali Grass				S2	3 Sensitive	2	50.1 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Indian Wild Rice				S2	5 Undetermined	6	80.2 ± 1.0	NB
P	*Piptatherum pungens*	Slender Rice Grass				S2	2 May Be At Risk	7	56.6 ± 0.0	NB
P	*Woodwardia virginica*	Virginia Chain Fern				S2	3 Sensitive	9	51.0 ± 0.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	14	68.2 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	2	62.0 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	3 Sensitive	1	95.0 ± 0.0	NB
P	*Crataegus macrosperma*	Big-Fruit Hawthorn				S2?	5 Undetermined	1	58.5 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	5	28.7 ± 0.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	3	3.6 ± 5.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	3 Sensitive	3	74.8 ± 10.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	5 Undetermined	1	58.8 ± 0.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S2S3	3 Sensitive	1	86.5 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	4 Secure	4	17.0 ± 2.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S2S3	3 Sensitive	1	59.0 ± 2.0	NB
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	15	28.3 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	1	64.4 ± 0.0	NB
P	*Geranium robertianum*	Herb Robert				S2S3	4 Secure	23	93.3 ± 4.0	PE
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	3 Sensitive	2	79.8 ± 50.0	NB
P	*Rumex maritimus var. persicarioides*	Peach-leaved Dock				S2S3	5 Undetermined	3	46.8 ± 4.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	5	27.2 ± 0.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	4 Secure	6	22.4 ± 2.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	24	8.6 ± 5.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S2S3	3 Sensitive	8	68.2 ± 0.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	5	23.3 ± 3.0	NB
P	*Juncus brachycephalus*	Small-Head Rush				S2S3	3 Sensitive	2	68.2 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3 Sensitive	1	83.0 ± 10.0	NB
P	*Listera auriculata*	Auricled Twayblade				S2S3	3 Sensitive	12	14.6 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	2	18.6 ± 1.0	NB
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2S3	3 Sensitive	2	59.0 ± 1.0	NB
P	*Stuckenia pectinata*	Sago Pondweed				S2S3	3 Sensitive	27	3.7 ± 0.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	3	17.9 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	4	59.0 ± 2.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	6	35.6 ± 3.0	NB
P	*Arnica lanceolata*	Lance-leaved Arnica				S3	4 Secure	21	58.5 ± 50.0	NB
P	*Artemisia campestris ssp. caudata*	Field Wormwood				S3	4 Secure	5	23.8 ± 5.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3	4 Secure	86	28.5 ± 0.0	NB
P	*Bidens hyperborea var. hyperborea*	Estuary Beggarticks				S3	4 Secure	12	69.5 ± 1.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	6	68.2 ± 0.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	6	38.5 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Betula pumila*	Bog Birch				S3	4 Secure	132	24.5 ± 0.0	NB
P	*Arabis glabra*	Tower Mustard				S3	5 Undetermined	8	61.5 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	14	12.5 ± 5.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	191	15.9 ± 1.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	47	28.8 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	4 Secure	5	86.2 ± 1.0	NB
P	*Hedysarum alpinum*	Alpine Sweet-vetch				S3	4 Secure	5	60.4 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	4 Secure	6	59.7 ± 1.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	5	15.5 ± 5.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	4 Secure	3	88.8 ± 0.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	10	52.3 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	48	31.9 ± 0.0	NB
P	*Nuphar lutea ssp. pumila*	Small Yellow Pond-lily				S3	4 Secure	4	17.1 ± 0.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	15	72.5 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	3	13.4 ± 0.0	NB
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S3	4 Secure	22	50.1 ± 0.0	NB
P	*Polygonum punctatum*	Dotted Smartweed				S3	4 Secure	1	85.0 ± 2.0	NB
P	*Polygonum punctatum var. confertiflorum*	Dotted Smartweed				S3	4 Secure	30	30.1 ± 0.0	NB
P	*Polygonum scandens*	Climbing False Buckwheat				S3	4 Secure	35	45.6 ± 0.0	NB
P	*Samolus valerandi*	Seaside Brookweed				S3	4 Secure	3	55.8 ± 0.0	NB
P	*Samolus valerandi ssp. parviflorus*	Seaside Brookweed				S3	4 Secure	136	24.8 ± 9.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	5	18.2 ± 10.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	5	89.9 ± 1.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	17	14.7 ± 0.0	NB
P	*Thalictrum venulosum*	Northern Meadow-rue				S3	4 Secure	1	95.6 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	4	64.3 ± 0.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	3	50.7 ± 1.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3	4 Secure	74	39.2 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	4 Secure	4	10.2 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	20	0.7 ± 5.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	4 Secure	84	16.7 ± 4.0	NB
P	*Comandra umbellata ssp. umbellata*	Bastard's Toadflax				S3	4 Secure	6	18.7 ± 0.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3	4 Secure	11	68.2 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	97	7.7 ± 1.0	NB
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S3	4 Secure	7	35.6 ± 3.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	3 Sensitive	7	93.3 ± 0.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	4 Secure	9	86.3 ± 0.0	NB
P	*Viola adunca*	Hooked Violet				S3	4 Secure	3	59.0 ± 2.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	6	68.2 ± 0.0	NB
P	*Carex aquatilis*	Water Sedge				S3	4 Secure	11	14.4 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	1	81.8 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	4 Secure	4	86.3 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	1	70.0 ± 0.0	NB
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	5	52.5 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	4 Secure	1	52.0 ± 10.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3	4 Secure	2	93.3 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	19	58.3 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	1	28.8 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	6	33.7 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3	4 Secure	1	41.9 ± 0.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	6	19.2 ± 10.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	3 Sensitive	8	68.2 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	19	43.9 ± 1.0	NB
P	*Carex recta*	Estuary Sedge				S3	4 Secure	17	29.6 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	1	81.1 ± 10.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	2	20.9 ± 2.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	1	86.8 ± 0.0	PE
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	4 Secure	31	57.6 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	35	57.3 ± 0.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	4 Secure	7	93.7 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S3	4 Secure	2	17.0 ± 2.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	19	26.6 ± 2.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	8	20.8 ± 3.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	79	21.1 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	9	29.8 ± 5.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	1	89.5 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	4 Secure	1	88.0 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	24	39.5 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	8	13.4 ± 0.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	3 Sensitive	2	18.6 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	46	12.2 ± 1.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	67	14.6 ± 1.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	4 Secure	3	70.4 ± 0.0	NB
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S3	4 Secure	3	70.4 ± 0.0	NB
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S3	4 Secure	3	77.1 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	4 Secure	1	93.3 ± 0.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	1	94.5 ± 0.0	NB
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	1	87.8 ± 0.0	NB
P	*Lycopodium sabinifolium*	Ground-Fir				S3	4 Secure	7	22.3 ± 1.0	NB
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	3 Sensitive	2	68.0 ± 1.0	NB
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S3	3 Sensitive	4	79.6 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	10	55.3 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	4 Secure	5	45.8 ± 1.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	4	68.1 ± 1.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	43	22.3 ± 0.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	9	11.2 ± 1.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	5 Undetermined	1	66.7 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	1	55.0 ± 1.0	NB
P	*Rumex maritimus*	Sea-Side Dock				S3S4	4 Secure	43	5.6 ± 0.0	NB
P	*Rumex maritimus var. fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	5	9.2 ± 0.0	NB
P	*Potentilla arguta*	Tall Cinquefoil				S3S4	4 Secure	4	67.1 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	107	1.6 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Geocaulon lividum*	Northern Comandra				S3S4	4 Secure	84	19.7 ± 1.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	4 Secure	11	51.2 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	81	19.6 ± 0.0	NB
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	4 Secure	91	26.4 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	9	26.6 ± 2.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	25	19.4 ± 0.0	NB
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	1	95.3 ± 1.0	PE
P	*Calamagrostis stricta var. stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	5	93.5 ± 0.0	NB
P	*Distichlis spicata*	Salt Grass				S3S4	4 Secure	70	26.7 ± 0.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	1	88.5 ± 0.0	NB
P	*Polygonum raii*	Sharp-fruited Knotweed				SH	0.1 Extirpated	9	2.2 ± 10.0	NB
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	1	63.4 ± 1.0	NB
P	*Botrychium campestre*	Prairie Moonwort				SH	2 May Be At Risk	1	81.8 ± 0.0	NB
P	*Agalinis maritima*	Saltmarsh Agalinis				SX	0.1 Extirpated	2	88.9 ± 50.0	NB

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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.

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99	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.
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88	Tremblay, E. 2006. Kouchibouguac National Park Digital Database. Parks Canada, 105 recs.
78	Hilaire Chiasson Rare vascular plant specimens in the Hilaire Chiasson Herabarium. 2015.
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53	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
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44	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
42	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
42	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
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38	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
37	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
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32	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
31	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
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30	Campbell, G., Villamil, L. 2012. Heath Steele Mine Bird Surveys 2012.
29	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
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28	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
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1	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
1	Boyne, A.W. 2001. Portage Island National Wildlife Area inspection visit. Canadian Wildlife Service, Sackville, 1 rec.
1	Chaput, G. 1999. Atlantic Salmon: Miramichi & SFA 16 Rivers. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-05. 6 recs.
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APPENDIX C.2

Commission de l'environnement de Tracadie
2014 Bird Survey Results

Oiseaux à la lagune de Tracadie-2014

Nom français	Nom anglais	Nom latin	Période observée
Balbuzard pêcheur	**Osprey**	*Pandion haliaetus*	niche à la lagune, mai à octobre
Canard branchu	**Wood Duck**	*Aix sponsa*	mai à octobre
Canard chipeau	**Gadwall**	*Anas strepera*	avril-novembre
Canard colvert	**Wild Duck**	*Ana platyrhynchos*	
Canard d'Amérique	**American Wigeon**	*Anas americana*	
Canard noir	**American Black Duck**	*Anas rubripes*	avril-novembre
Canard pilet	**Northern Pintail**	*Anas acuta*	
Canard souchet	**Northern Shoveler**	*Anas clypeata*	avril-novembre
Chevalier grivelé	**Spotted sandpiper**	*Actitis macularius*	peut être observé de juin à octobre
Chevalier solitaire	**Solitary sandpiper**	*Tringa solitaria*	peut être observé de juin à octobre
Cormoran à aigrettes	**Double-crested Cormorant**	*Phalacrocorax auritus*	
Érismature rousse	**Ruddy Duck**	*Oxyura jamaicensis*	mai à octobre
Fuligule à collier	**Ring-necked Duck**	*Aythya collaris*	
Fuligule milouinan	**Greater Scaup**	*Aythya marila*	
Goéland à bec cerclé	**Ring-billed Gull**	*Larus delawarensis*	
Goéland arctique	**Great Black-backed Gull**	*Larus marinus*	décembre à mars
Goéland bourgmestre	**Glaucous gull**	*Larus hyperboreus*	décembre à mars
Goéland marin	**Great black-backed gull**	*Larus marinus*	
Grand chevalier	**Greater yellowlegs**	*Tringa melanoleuca*	peut être observé de juin à octobre
Grand-duc d'Amérique	**Great horned owl**	*Bubo virginianus*	observé près en 2013, il nichait au Camp Richelieu
Hirondelle bicolore	**Tree Swallow**	*Tachycineta bicolor*	mai à septembre
Mouette de Bonaparte	**Bonaparte's Gull**	*Larus philadelphia*	mai à septembre
Petit chevalier	**Lesser yellowlegs**	*Tringa flavipes*	peut être observé de juin à octobre
Petit fuligule	**Lesser Scaup**	*Aythya affinis*	
Sarcelle d'hiver	**Eurasian Teal**	*Anas crecca*	
Rares			
Canard siffleur	**Eurasian wigeon**	*anas penelope*	avril, mai, juin
Fuligule à tête rouge	**Redhead**	*Aythya americana*	mai
Mouette pygmée	**Little gull**	*Hydrocoloeus minutus*	mai, mi-juillet, aout, septembre
Mouette rieuse	**Black-headed gull**	*Chroicocephalus ridibundus*	aout, vu à l'occasion en avril et une fois en

			décembre
Petit garrot	**Bufflehead**	*Bucephala albeola*	
Phalarope de Wilson	**Wilson's Phalarope**	*Phalaropus tricolor*	mai, septembre, observé durant les migrations
Poule d'eau	**Common Moorhen**	*Gallinula chloropus*	
Une mention			
Foulque d'Amérique	**American coot**	*Fulica americana*	une fois en mai 2007
Fuligule à dos blanc	**Canvasback**	*Aythya valisineria*	une fois le 1er décembre 2011
Fuligule morillon	**Tufted Duck**	*Aythya fuligula*	une fois en mai et une fois en octobre
Phalarope à bec étroit	**Red-necked phalarope**	*Phalaropus lobatus*	une fois le 9 aout 1991

APPENDIX D:

Tracadie Approval to Operate

AGRÉMENT D'EXPLOITATION

S-2575

Conformément au paragraphe 8(1) *du Règlement sur la qualité de l'eau établi en vertu de la Loi sur l'assainissement de l'environnement*, cet agrément d'exploitation est par les présentes émis à:

Grand Tracadie-Sheila

pour l'exploitation des

Ouvrages d'évacuation des eaux usées – lagune rue des Canards

Description de la source:	Cet agrément couvre le rejet d'effluent à partir des emplacements contenus dans le Système d'information et de rapports réglementaires sur les effluents pour l'ouvrage suivant. **Lagune aérée** **CEU: Classe I / EEU: Classe I**
Adresse postale:	**3620, rue Principale** **Tracadie-Sheila, N.-B. E1X 1G5**
Conditions de l'agrément:	**Se référer à l'annexe « A » du présent agrément**
Remplace l'agrément:	**S-2278**
Valide à partir du:	**1 décembre 2014**
Date d'expiration:	**30 novembre 2019**

Recommandé par: _____
Division de l'environnement

Émis par: _____ Le 26 novembre, 2014
pour Ministre de l'Environnement et Gouvernements locaux Date

ANNEXE « A »

A. DÉFINITIONS

1. **« Accrédité »** désigne l'accréditation ISO/IEC 17025 par le Conseil canadien des normes (CCN), par la « *Canadian Association for Laboratory Accreditation Inc*. » (CALA), ou encore l'accréditation ISO/IEC 17025 par un autre organisme étant reconnu pour accorder une telle accréditation selon les critères ISO/IEC 17011.

2. **« Agent d'autorisation »** désigne le Gérant de la Section de la Gestion des eaux et des eaux usées du Ministère de l'Environnement et des gouvernements locaux, ainsi que toute personne désignée pour agir au nom du Gérant.

3. **« Certifié »** désigne le détenteur d'un certificat valide de qualification sur lequel est stipulée la classe de l'*opérateur* déterminée selon le Programme d'accréditation volontaire des préposés aux installations d'eau et d'eaux usées au Canada Atlantique.

4. **« Chlore résiduel total »** désigne la quantité totale de chlore libre et de chlore combiné, y compris les chloramines inorganiques.

5. **« DBOC »** ou **« Matières exerçant une demande biochimique en oxygène de la partie carbonée »** désigne les matières carbonées qui consomment de l'oxygène dissous dans l'eau par oxydation biochimique.

6. **« Lagune »** désigne une installation d'épuration des eaux usées où la période de rétention moyenne des eaux usées à l'intérieur de l'installation, pour l'épuration, est de cinq jours ou plus.

7. « **Létalité aiguë** », s'agissant d'un effluent, désigne la capacité de provoquer, à l'état non dilué, la mort de plus de 50 % des truites arc-en-ciel qui y sont exposées pendant une période de quatre-vingt-seize heures.

8. **« Matières en suspension »** désigne toutes matières solides dans l'effluent retenues sur un papier-filtre ayant des pores d'au plus 2.0 micromètres (μm).

9. **« Opérateur »** désigne une personne qui dirige, ajuste, inspecte, analyse ou évalue une exploitation ou un procédé qui contrôle l'efficacité ou l'efficience de l'ouvrage d'évacuation des eaux usées.

10. **« Point de débordement »** désigne tout point de rejet d'un ouvrage d'évacuation des eaux usées à partir duquel un trop plein d'eaux usées peut être rejeté et au-delà duquel la qualité des eaux usées, avant leur rejet comme effluent dans des eaux ou autres lieux, n'est plus assujettie au contrôle du propriétaire ou de l'exploitant.

11. **« Point d'entrée »** désigne tout point ou l'effluent est rejeté dans les eaux fréquentées par les poissons à partir du *point de rejet final* ou un *point de débordement*.

12. **« Point de rejet final »** désigne le point de l'ouvrage d'évacuation des eaux usées, autre qu'un *point de débordement*, au-delà duquel la qualité des eaux usées avant leur rejet comme effluent dans l'environnement n'est plus assujettie au contrôle du propriétaire ou de l'exploitant.

13. **« Titulaire de l'agrément"** désigne le nom identifié sur la page couverture du présent Certificat d'agrément.

14. **« Trimestre »** désigne une période de trois mois commençant le premier jour de janvier, d'avril, de juillet ou d'octobre de l'année en cause.

15. **« Urgence environnementale »** désigne une situation où il y a eu ou qu'il risque d'y avoir un rejet, un déversement ou un dépôt d'un ou de plusieurs polluants dans l'atmosphère, le sol, l'eau de surface, et/ou l'eau souterraine et qui est d'une ampleur ou d'une durée telle qu'il pourrait en résulter des dommages considérables à l'environnement ou que la santé du grand public pourrait en être compromise. Ceci n'inclut pas les débordements d'eaux usées attribuables à des averses de pluie ou des fontes de neige excessives.

16. « **SIRRE** » ou « **Système d'information pour les rapports réglementaires sur les effluents** » désigne l'application Web élaborée par Environnement Canada pour faciliter la production de rapports sur les renseignements requis par les règlementations.

17. « **Substances nocives »** sont désignées comme les substances ou les catégories de substances suivantes : les matières exerçant une demande biochimique en oxygène de la partie carbonée; les matières en suspension; le chlore résiduel total; et, l'ammoniac non ionisé.

18. **« Volume journalier moyen »** désigne le calcul de la somme des volumes journaliers d'influent ou d'effluent et la division de cette somme par le nombre de jours compris dans l'année civile.

B. CONDITIONS DE L'AGRÉMENT

RAPPORT DES URGENCES

19. Lorsqu'une *urgence environnementale* est constatée, un représentant désigné du *titulaire de l'agrément* doit **immédiatement** aviser la Garde côtière canadienne **jusqu'à ce qu'on arrive à joindre un agent** (p. ex. aucun message dans la boîte vocale ne sera accepté) et fournir le plus de renseignements disponibles possible concernant l'*urgence environnementale,* tel que: l'endroit en latitude et longitude, débit, heure, et une brève description.

    Le numéro de téléphone pour la **Garde côtière canadienne** est le **1 800 565-1633.**

20. **Dans les cinq (5) jours** suivants le premier avis, une copie du **Rapport détaillé de l'urgence** doit être envoyée, par courriel ou par télécopieur, à l'ingénieur ou au coordonnateur des agréments d'eaux usées responsable de réglementer l'ouvrage d'évacuation des eaux usées du *titulaire de l'agrément.* Le Rapport détaillé de l'urgence doit comprendre au moins les éléments suivants : (i) une description du problème survenu; (ii) une description de l'impact résultant du problème; (iii) une description des mesures qui ont été prises pour atténuer l'impact; et (iv) une description des mesures qui ont été prises pour prévenir la récurrence de ce problème.

AUTORISATION TEMPORAIRE DE DÉRIVATION

21. Le *titulaire de l'agrément* doit faire une demande d'autorisation temporaire de dérivation à l'*agent d'autorisation* pour soustraire les eaux usées du système à au moins un des processus de traitement habituel. La demande doit être présentée, en la forme précisée dans le *SIRRE*, **au moins quarante-cinq (45) jours avant la date** à laquelle la dérivation est requise.

NORMES DE PERFORMANCE DE L'EFFLUENT

22. Le *titulaire de l'agrément* doit s'assurer que la concentration moyenne de polluant dans l'effluent rejeté à partir du *point de rejet final* de l'ouvrage d'évacuation des eaux usées ne dépasse pas les critères limites suivants. La moyenne doit être calculée en utilisant la période de calcul applicable identifiée à la condition 29.

    i. *DBO_5C*: 25 mg/L (moyenne); et,
    ii. *Matières en suspension*: 25 mg/L (moyenne).

23. Pour une *lagune*, le *titulaire de l'agrément*, lors de la détermination de la moyenne visée à la condition 22, ne doit pas tenir compte du résultat de la détermination de la concentration de *matières en suspension* visée à la condition 29 provenant d'un échantillon prélevé durant le mois de juillet, d'août, de septembre ou d'octobre, si elle dépasse 25 mg/L.

24. Le *titulaire de l'agrément* doit **immédiatement** faire une demande à l'*agent d'autorisation*, en la forme précisée dans *SIRRE*, si un échantillon de l'effluent rejeté à partir du *point de rejet final* contient une concentration d'ammoniac non ionisé égal ou supérieur à 1,25 mg/L**,** exprimée sous forme d'azote (N) à 15°C ± 1°C.

25. **D'ici le 1er janvier 2016**, pour les systèmes où le *volume journalier moyen* de l'effluent calculé à la condition 27 est inférieur à 5 000 m^3, le *titulaire de l'agrément* doit soumettre à l'*agent d'autorisation* un plan à long terme pour assurer que l'effluent du *point de rejet final* n'excèdera pas la concentration moyenne de *chlore résiduel total* de 0,02 mg/L.

26. **D'ici le 1er janvier 2015**, pour les systèmes dont le *volume journalier moyen* de l'effluent calculé à la condition 27 est supérieur ou égal à 5 000 m^3, le *titulaire de l'agrément* doit assurer que la concentration de *chlore résiduel total* dans l'effluent rejeté à partir du *point de rejet final* ne dépasse pas 0,02 mg/L si le chlore, ou l'une de ses composantes, est utilisé pour le traitement des eaux usées. Pour tous autres systèmes, soit ceux dont le *volume journalier moyen* de l'effluent calculé à la condition 27 est inférieur à 5 000 m^3, le *titulaire de l'agrément* doit assurer que la concentration de *chlore résiduel total* dans l'effluent rejeté à partir du *point de rejet final* ne dépasse pas 0,02 mg/L si le chlore, ou l'une de ses composantes, est utilisé pour le traitement des eaux usées **d'ici le 1er janvier 2021**.

SURVEILLANCE ET ÉCHANTILLONNAGE

Conformément au paragraphe 17 du *Règlement sur la qualité de l'eau*, cet agrément est assujetti aux conditions suivantes:

27. Le *titulaire de l'agrément* doit, pour chaque année civile, calculer et noter le *volume journalier moyen* d'effluent rejeté à partir du *point de rejet final*. Le volume d'effluent durant chaque jour doit être déterminé en utilisant un équipement de surveillance qui fournit :
    i. une mesure en continu du volume de l'affluent ou de l'effluent, ou une mesure du débit de l'affluent ou de l'effluent à partir de laquelle une estimation du volume journalier peut être effectuée; ou,
    ii. une mesure en continu du volume de l'affluent ou de l'effluent si le *volume journalier moyen* au cours de l'année civile précédente dépassait 2 500 m^3.

28. Le *titulaire de l'agrément* doit recueillir des échantillons pour les paramètres suivants conformément aux exigences de la condition 29:
    i. La concentration de *DBOC;* et*,*
    ii. La concentration de *matières en suspension*.

29. Le *titulaire de l'agrément* doit recueillir des échantillons, à partir du *point de rejet final,* du type et à la fréquence indiquée ci-dessous selon le *volume journalier moyen* de l'effluent calculé à la condition 27:

Volume journalier moyen **(m^3)**	**Type de traitement**	**Type d'échantillon à prélever**	**Fréquence d'échantillonnage**	**Période de calcul[1]**	**Fréquence des rapports**
≤ 2 500	*Lagune*	Instantané ou composite	Trimestrielle, à au moins 60 jours d'intervalle	Annuelle	Annuelle
	Mécanique	Instantané ou composite	Tous les mois, à au moins 10 jours d'intervalle	Trimestrielle	Trimestrielle
> 2 500 et ≤ 17 500	*Lagune*	Instantané ou composite	Toutes les 2 semaines, à au moins 7 jours d'intervalle	Trimestrielle	Trimestrielle
	Mécanique	Composite			
> 17 500 et ≤ 50 000	*Lagune*	Instantané ou composite	Toutes les semaines, à au moins 5 jours d'intervalle	Mensuelle	Trimestrielle
	Mécanique	Composite			
> 50 000	*Lagune*	Instantané ou composite	Trois jours par semaine, à au moins un jour d'intervalle	Mensuelle	Trimestrielle
	Mécanique	Composite			

[1] La moyenne doit être déterminée pour la *DBOC* et les *matières en suspension*.

30. Le *titulaire de l'agrément* doit recueillir un échantillon instantané au *point de rejet final* pour la toxicité de *létalité aiguë* selon la fréquence indiquée ci-dessous selon le *volume journalier moyen* de l'effluent calculé à la condition 27:

Volume journalier moyen **(m^3)**	**Fréquence d'échantillonnage minimum**
≤ 2 500	s.o.
> 2 500 et ≤ 50 000	Trimestrielle[1]
> 50 000	Mensuelle[2]

[1] à au moins soixante (60) jours d'intervalle
[2] à au moins vingt-et-un (21) jours d'intervalle

31. Si un échantillon est déterminé d'être de *létalité aiguë* au *point de rejet final,* le *titulaire de l'agrément* doit **immédiatement** avisé l'*agent d'autorisation*.

32. Si les résultats du *point de rejet final* sont déterminés de ne pas être de *létalité aiguë* selon la condition 33, le *titulaire de l'agrément* peut réduire la fréquence d'échantillonnage indiquée ci-dessous selon le *volume journalier moyen* de l'effluent calculé à la condition 27:

Volume journalier moyen **(m^3)**	**Nombre de tests sans létalité aiguë**	**Fréquence réduite[1]**
≤ 2 500	s.o.	s.o.
> 2 500 et ≤ 50 000	4 trimestres consécutifs	Annuelle[2]
> 50 000	12 mois consécutifs	Trimestrielle[3]

[1] fréquence réduite si le nombre de tests consécutifs de la colonne 2 de ce tableau sont passés
[2] à au moins six (6) mois d'intervalle
[3] à au moins soixante (60) jours d'intervalle

33. Le titulaire de l'agrément soit s'assurer que la *létalité aiguë* de l'effluent soit déterminée conformément à la méthode de référence SPE 1/RM/13 et SPE 1/RM/50.

34. **Dans un délai de six (6) mois** après avoir complété l'Évaluation du risque environnemental, le *titulaire de l'agrément* doit soumettre à l'*agent d'autorisation* pour approbation, un Plan de surveillance de l'effluent basé sur l'Évaluation du risque environnemental de l'ouvrage d'évacuation des eaux usées. Ce plan doit inclure les paramètres qui sont les Objectifs environnementaux de rejet et une fréquence de surveillance pour chacun.

35. Le *titulaire de l'agrément* doit suivre la fréquence de surveillance identifiée dans le Plan de surveillance de l'effluent pour les paramètres identifiés dans le plan approuvé.

36. Le *titulaire de l'agrément* doit calibrer l'équipement de surveillance du débit ou du volume au moins une fois durant l'année civile et à au moins cinq mois d'intervalle.

37. Le *titulaire de l'agrément* doit s'assurer que l'équipement de surveillance permet de déterminer le volume ou le débit selon une marge d'erreur de ±15%.

38. Le *titulaire de l'agrément* doit s'assurer que les échantillons sont prélevés selon les méthodes décrites dans la plus récente version de la norme ISO 5667-10 « Water quality - sampling – Part 10 : Guidance on sampling of wastewater ».

39. Le *titulaire de l'agrément* doit s'assurer que tous les paramètres qui doivent être analysés selon le présent agrément soient analysés par des laboratoires *accrédités,* dont l'accréditation couvre la méthode d'analyse utilisée pour effectuer les déterminations en cause.

40. Le *titulaire de l'agrément* doit s'assurer que l'équipement utilisé pour la surveillance des paramètres requis par le présent agrément est calibré conformément aux recommandations du fabricant.

GESTION DES DÉBORDEMENTS

41. **D'ici le 1er janvier 2016**, le *titulaire de l'agrément* doit élaborer un plan à long terme visant à réduire les débordements d'égouts combinés ainsi qu'à réduire les débordements liés à l'infiltration. Le plan doit suivre, au minimum, les lignes directrices de l'*agent d'autorisation* du « Plan de gestion à long terme des débordements d'égouts combinés et sanitaires » du *ministère.*

42. **D'ici le 1er janvier 2016**, le *titulaire de l'agrément* doit s'assurer que toutes les nouvelles stations de pompage sont conçues pour prévenir le rejet de matériaux flottants, et que les stations de pompage existantes sont modifiées de façon à permettre l'enlèvement des matériaux flottants.

CERTIFICATION DES OPÉRATEURS

43. Conformément au paragraphe 19 du *Règlement sur la qualité de l'eau*, le ministre avise que le *titulaire de l'agrément* doit employer et avoir à sa disposition le(s) *opérateur(s) certifié(s)* suivant(s) selon la classe de l'installation identifiée sur la page couverture du présent Certificat d'agrément.

Classe "Épuration"	***Opérateur(s) certifié(s)* Épuration des eaux usées (EEU)**	**Classe "Collecte"**	***Opérateur(s) certifié(s)* Collecte des eaux usées (CEU)**
I	Minimum d'un *opérateur* Classe I	I	Aucun
II	Minimum d'un *opérateur* Classe II et d'un opérateur Classe I	II	Un *opérateur* Classe I d'ici le 31 décembre 2016
III	Minimum d'un *opérateur* Classe III et d'un *opérateur* Classe II	III	Un *opérateur* Classe I d'ici le 31 décembre 2016
IV	Minimum d'un *opérateur* Classe IV et d'un *opérateur* Classe III	IV	Un *opérateur* Classe I d'ici le 31 décembre 2016

TENUE DE REGISTRE

Conformément au paragraphe 17 du *Règlement sur la qualité de l'eau*, cet agrément est assujetti aux conditions suivantes:

44. Le *titulaire de l'agrément* doit maintenir et conserver des dossiers pendant une période de 5 ans concernant l'information suivante, et ceux-ci doivent être mis à la disposition de l'*agent d'autorisation* sur demande:
    a. Les dates auxquelles aucun effluent n'a été rejeté à partir du *point de rejet final* (si applicable);

b. Pour chacune des dates auxquelles un effluent a été rejeté à partir du *point de rejet final*:
    i. le volume journalier rejeté, en m^3, s'il a été obtenu par une mesure en continu, ou
    ii. l'estimation du volume journalier, en m^3, dans les autres cas, et les résultats des calculs et mesures utilisés pour les estimations, tel que décrit à la condition 27(i);
c. Pour tous les débordements d'eaux usées pour chaque *point de débordement*, y compris ceux causés par la pluie excessive ou la fonte des neiges:
    i. les dates au cours desquelles un effluent a été rejeté à partir du *point de débordement*,
    ii. pour chacune de ces dates, la durée ou une estimation de la durée du débordement au cours de laquelle un effluent a été rejeté à partir de ce point, exprimée en heures, ainsi qu'une mention indiquant s'il s'agit de la durée réelle ou d'une estimation,
    iii. le volume journalier rejeté en m^3, s'il a été obtenu par une mesure en continu ou l'estimation du volume journalier en m^3, dans les autres cas;
d. Pour tout équipement de surveillance utilisé pour déterminer le volume ou le débit:
    i. sa description, y compris son type,
    ii. les spécifications du fabricant, l'année de fabrication et le numéro du modèle,
    iii. la date à laquelle l'équipement fut calibré et le degré d'exactitude de l'équipement après la calibration,
    iv. la date de son installation et, le cas échéant, celle à laquelle il cesse d'être utilisé et celle à laquelle il est remplacé;
e. Pour chaque échantillon exigé par la condition 29, ainsi que pour chaque échantillon additionnel analysé par un laboratoire *accrédité*:
    i. les résultats des analyses pour chacun des paramètres identifiés à la condition 28 et condition 30 (si applicable),
    ii. le type d'échantillon prélevé, soit instantané ou composite, et la date du prélèvement;
f. Tous les résultats d'analyses pour chacun des paramètres du Plan de surveillance de l'effluent;
g. Tous les résultats d'analyses exigées à l'annexe « B », si applicable; et,
h. Une liste identifiant le(s) opérateur(s) et indiquant le degré de certification de chaque opérateur(s).

RAPPORT

Conformément au paragraphe 17 du *Règlement sur la qualité de l'eau*, cet agrément est assujetti aux conditions suivantes:

45. S'il y a un changement à l'information dans le rapport d'identification dans le *SIRRE*, le *titulaire de l'agrément*, au plus tard **quarante-cinq (45) jours après le changement**, doit aviser l'*agent d'autorisation* du rapport d'identification modifié.

46. Le *titulaire de l'agrément* doit soumettre électroniquement à l'*agent d'autorisation*, en la forme précisée dans le *SIRRE*, un rapport pour la période de rapport précédente:
    i. **quarante-cinq (45) jours suivant la fin de chaque année**, celle-ci débutant le premier jour de janvier de chaque année, pour une lagune ayant un *volume journalier moyen* d'effluent inférieur à 2 500 m^3/jour;
    ii. **quarante-cinq (45) jours suivant la fin de chaque *trimestre***, le premier *trimestre* débutant le premier jour de janvier de chaque année, pour tous les autres ouvrages.

    Le rapport doit inclure l'information suivante:
    a. Le nombre de jours au cours desquels l'effluent a été rejeté;
    b. Le volume d'effluent rejeté, exprimé en m^3;
    c. La concentration moyenne de *DBOC* dans l'effluent;
    d. La concentration moyenne de *matières en suspension* dans l'effluent;
    e. Tous les résultats d'analyses complétées conformément au Plan de surveillance de l'effluent approuvé exigé à la condition 36;
    f. Les résultats d'analyses pour la toxicité de *létalité aiguë;* et,
    g. Si une autorisation temporaire de dérivation a été émise.

47. Le *titulaire de l'agrément* doit soumettre à l'*agent d'autorisation* **quarante-cinq (45) jours suivants la fin de chaque année**,
    a. Un résumé de tous les incidents, y compris la date, l'emplacement, la durée incluant s'il s'agit de la durée réelle ou d'une estimation et le volume calculé ou estimé pour chaque rejet d'eaux usées à partir de *point de débordement*, y compris ceux causés par la pluie excessive ou la fonte des neiges;
    b. Un résumé de toutes les *urgences environnementales* survenues qui ont été signalées à l'aide des modalités énoncées à la section « Rapport des urgences » du présent agrément; et,
    c. Tous les résultats d'analyses exigées à l'annexe « B », si applicable.

APPENDIX E:

Natech Ecological Risk Assessment Report

Environmental Risk Assessment for the Town of Tracadie-Sheila Wastewater Treatment Plant No.1 (north), in Accordance with the Canada-Wide Strategy for Municipal Wastewater Effluent

Submitted to: **Roy Consultants**
3655, rue Principale
Tracadie-Sheila, N.B.
E1X 1E2

Prepared by: **NATECH Environmental Services Inc.**
2492 Route 640
Hanwell, N.B.
E3E 2C2

Date: **March 23, 2012**

NATECH

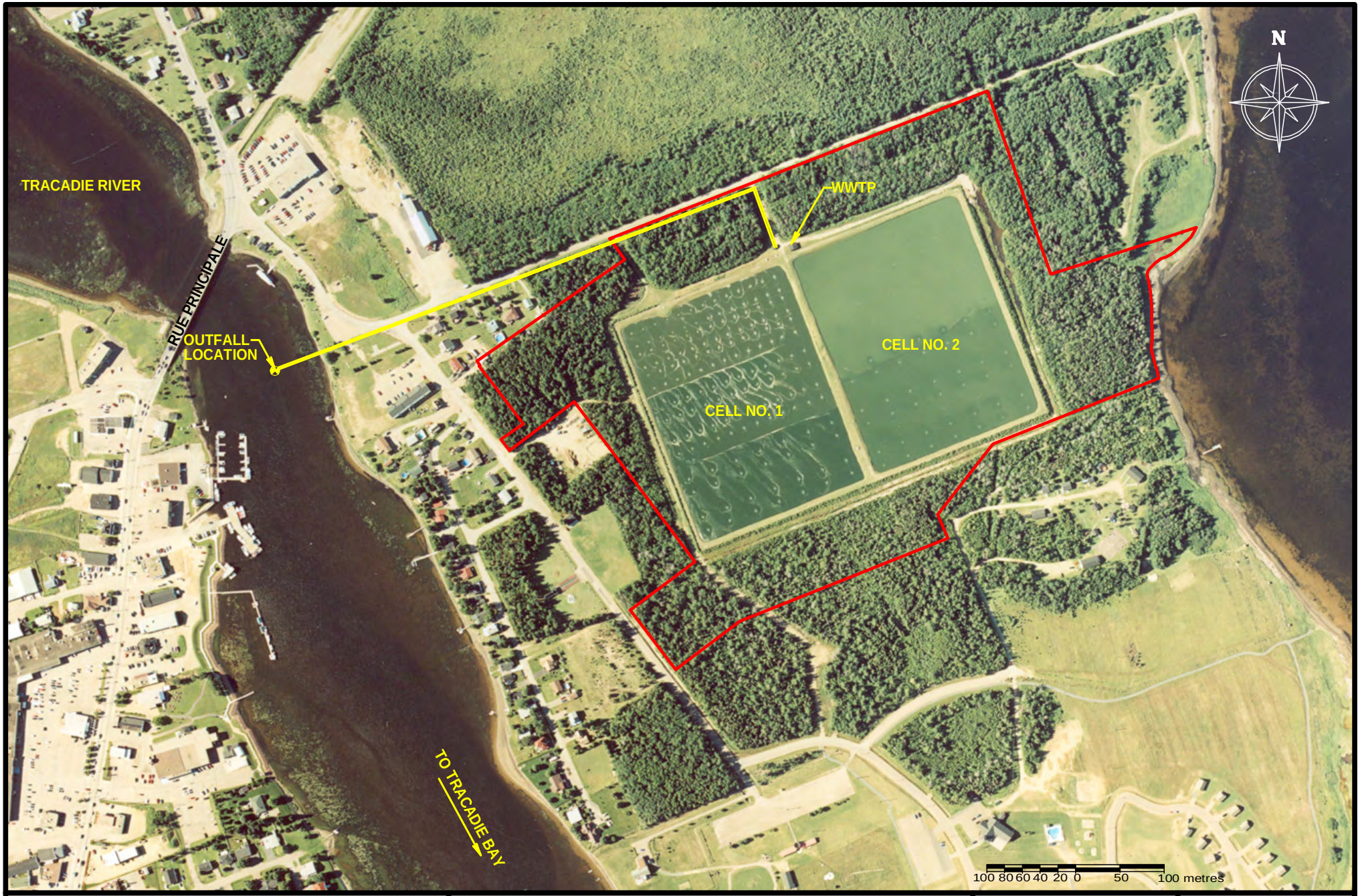
TABLE OF CONTENTS

1. INTRODUCTION

The ***Canada-wide Strategy for the Management of Municipal Wastewater Effluent*** was released by the Canadian Council of Ministers of the Environment (CCME) in 2009 to improve the protection of human health and the environment, and to provide better clarity in the way municipal wastewater effluent is managed across the country. The strategy is based on preparing a site-specific Environmental Risk Assessment (ERA) for each municipal wastewater treatment plant in the country. The Province of New Brunswick is a signatory to the strategy and has requested that the Town of Tracadie-Sheila starts the one-year water quality monitoring program in 2010 for its two wastewater treatment plants (WWTP). WWTP No.1 is located in Tracadie, north of the town centre, and WWTP No.2 is smaller and located in Sheila, south of the town. NATECH Environmental Services Inc. was asked by Roy Consultants to carry out the ERA.

The objective of this ERA is to provide Effluent Discharge Objectives for the Tracadie lagoons (WWTP No. 1) based on the assimilative capacity of the local receiving environment (the Little Tracadie River estuary). Figure 1-1 shows the location of the WWTP. The plant consists of two aerated lagoon cells. Effluent disinfection is not provided. The effluent is discharged through a single pipe into the middle of the river. The river is affected by tides in the outfall area.

The Sheila lagoon (WWTP No.2) discharges into the shallow estuary of Mc Laughlin Brook, which is subject to eutrophication. A recommendation in the ERA for WWTP No.2 is to pump the effluent into the wastewater collection system for WWTP No. 1 instead of discharging it into the environment. The effluent would receive additional treatment at WWTP No. 1, before being discharged into the Tracadie River channel, which has a greater assimilative than McLaughlin Brook. However, an assessment of the impact on such an increase in effluent flow is beyond the scope of this study.



ENVIRONMENTAL RISK ASSESSMENT

TRACADIE-SHEILA WWTP No. 1

SITE LOCATION

NATECH

Environmental Services Inc.

2492 Route 640, Hanwell, NB E3E 2C2

Ph: (506) 455-1080 Fax: (506) 455-1088

Date:	Date:	Project No.:	Nº du projet
11/02/07		RC 475-09-01	
Scale:	Echelle:	Sheet No.:	Nº de la feuille:
AS SHOWN		FIGURE 1-1	

The methodology used to carry out this investigation is in accordance with the ERA framework outlined in the technical supplements of the CCME Strategy:

- ❑ A one year characterisation of the effluent is carried out by the municipality, including flow monitoring, sampling for chemical parameters, and toxicity tests. The number of parameters and the frequency of sampling depend on the size of the municipality.

- ❑ Environmental Quality Objectives (EQOs), which are safe concentrations of contaminants in the environment for humans and eco system components are determined.

- ❑ An allocated mixing zone (MZ) in the receiving water body is determined: the MZ is the extent of the water body around the outfall where the effluent is initially diluted, and where contaminant concentrations greater than the EQOs are authorised by the regulators.

- ❑ The target Effluent Discharge Objectives (EDOs) are calculated. The EDOs are maximum acceptable concentrations in the effluent from the WWTP. They are calculated based on worst-case conditions to ensure that at the edge of the MZ, the EQOs are met at all times.

- ❑ Compliance monitoring requirements are determined, specifying what parameters should be regularly sampled for, and at what frequency, after the one-year characterisation is complete.

The process of determining EDOs involves a combination of documentation review, consultation with stakeholders, field investigations, and mathematical modeling.

2. SUBSTANCES OF POTENTIAL CONCERN

2.1 Facility size categorization

According to the definitions in the CCME Strategy, the Tracadie-Sheila WWTP No.1 is characterized as a "medium" category facility (wastewater flows of 2,500 to 17,500 m^3/day):

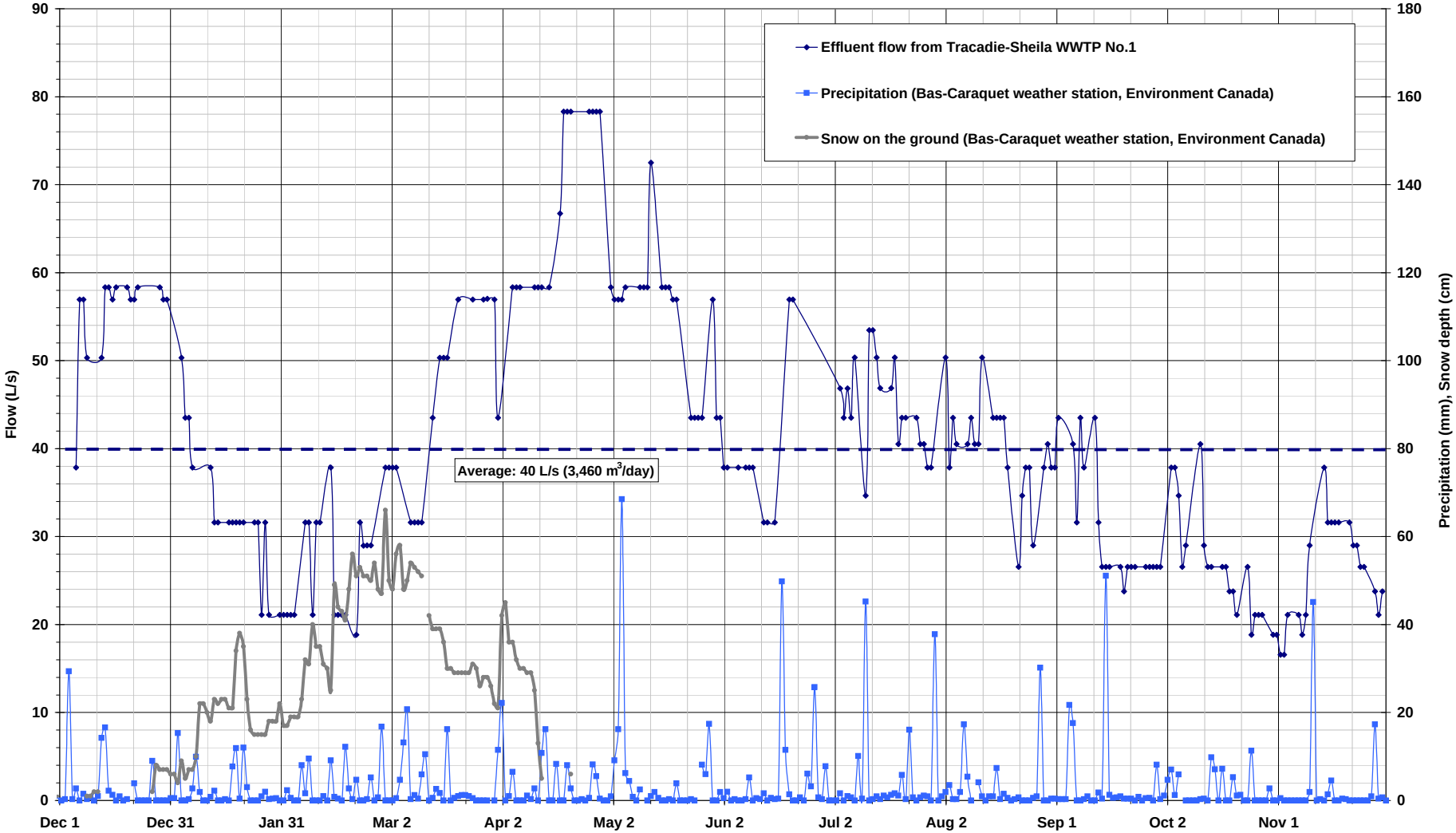
- Theoretically, for 898 residences connected to the WWTP, the annual average daily wastewater flow would be 1,260 m^3/day (15 L/s), assuming 1.4 m^3/day/dwelling.

- In reality, the measured annual average daily wastewater flow from December 2010 to November 2011 was 3,460 m^3/day (40 L/s). Figure 2-1 details the daily records The graph shows that in most cases, a sharp increase in discharge can be observed after a significant rainfall event. The measured peak flow during the period was 6,770 m^3/day (78 L/s), and the dry weather flow was approximately 2,330 m^3/day (27 L/s).

The measured flows are significantly higher than anticipated. This excess flow is likely due to inflow and infiltration into the municipal sewer system.

According to the local municipal engineer (Roy Consultants), there are no industries that discharge process water into the municipal sewer system at a level that would exceed 5% of the theoretical dry weather wastewater flow.

Measured Effluent Flows from December 2010 to December 2011



Environmental Risk Assessment
Tracadie - Sheila WWTP No. 1
Measured effluent flow in 2010-2011

NATECH Environmental Services Inc.
2492 Route 640
Hanwell, NB, CANADA,
E3E 2C2

SCALE: As shown

DATE: 2012/03/01

FILE: RC-475-09-01

FIGURE: 2-1

2.2 Determination of the list of substances of potential concern

The substances of potential concern for a medium size facility such as the WWTP No.1 in Tracadie-Sheila are listed in Table 2.1, based on CCME (2009).

2.3 Additional substances associated with industrial discharges

No additional substances from industrial discharges were identified in consultation with Roy Consultants.

Table 2.1. List of Substances of Potential Concern for Tracadie-Sheila WWTP No.1

Test Group	Substances
General Chemistry / Nutrients	Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) Chemical Oxygen Demand (COD) Total Suspended Solids (TSS) Total Ammonia Nitrogen Total Kjeldahl Nitrogen (TKN) Total Phosphorus (TP) pH, Temperature Cyanide (total) Fluoride Nitrate Nitrate + Nitrite
Pathogens	E. coli Faecal coliforms
Metals	Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, zinc
Organochlorine Pesticides	Achlordane, Aldrin, alpha-BHC, DDT, dieldrin, endosulfan (I and II), endrin, g-chlordane, heptachlor epoxide, lindane (gamma-BHC), methoxychlor, mirex, toxaphene
Polychlorinated Biphenyls (PCBs)	Total PCBs
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i,)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, methylnaphthalene, naphthalene, phenanthrene, pyrene
Volatile Organic Compounds (VOCs)	Benzene, bromodichloromethane, bromoform, carbon tetrachloride, chlorobenzene, chlorodibromomethane, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, dichloromethane, ethylbenzene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethene, toluene, trichloroethene, vinyl chloride m/p-xylene, o-xylene
Phenolic compounds	2,3,4,6–tetrachlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, pentachlorophenol
Surfactants	Non-ionic surfactants and anionic surfactants (others may be added by the jurisdiction)

3. INITIAL EFFLUENT CHARACTERIZATION PROGRAM - METHODOLOGY

Table 3.1 summarises at what frequency the substances of concern have to be measured for a period of one year for a medium-size facility.

Table 3.1: Monitoring requirements during one year, for Tracadie-Sheila WWTP No.1

Parameter	Sampling frequency	Procedure
Flow	Daily	Measured by operator
$CBOD_5$	Every two weeks	Sampled by operator, analysed by laboratory
TSS		
NH_3-N Total		
TKN		
TP		
E. Coli		
Faecal coliforms (1)		
pH		Measured by operator
Temperature		
COD (chem. oxygen demand)	Quarterly	Sampled by operator, analysed by laboratory
Fluoride		
Nitrate		
Nitrate +Nitrite		
Cyanide (total)		
Metals, metal hydrides, mercury (25 substances)		
Organochlorine pesticides (15 substances)		
PCBs		
PAHs (17 substances)		
VOCs (20 substances)		
Phenolic compounds (4 substances)		
Surfactants (non-ionic and anionic)		
Acute toxicity (Rainbow trout)		
Acute toxicity (Daphnia magna)		
Chronic Toxicity (Ceriodaphnia dubia)		
Chronic Toxicity (Fathead minnow) optional		

(1) Added to allow an assessment of the impact on shellfish

4. RECEIVING WATER BODY CHARACTERIZATION

4.1 Water body physical characteristics

The outfall is located in the Little Tracadie River, approximately 100 m downstream of the bridge on Rue Principale in downtown Tracadie, on the eastern side of the river (see Figure 1-1). Figures 4-1 and 4-2 show a topographic map and a hydrographic chart of the surrounding area. The outfall location is in the tidal section of the estuary. Typical depths in the area are in the order of two metres or less at low tide.

Table 4.1 summarises the characteristics of the Little Tracadie River. The flows were prorated based on the closest available gauging station, located on the Big Tracadie River. The average flow is calculated to be 5,591 L/s, and the 7 day-10 year (7DQ10) low flow is 721 L/s.

Tidal water level variations typical of the area are summarised in Table 4.2. Predicted water levels for Tracadie obtained from the Canadian Hydrographic Service are plotted on Figure 4-3 for July and August of 2010. Over that period, the levels varied between 0.3 m and 1.4 m above chart datum (which is the lowest low water level), and the average water level was 0.65 m.

Table 4.1. Characteristics of Little Tracadie River

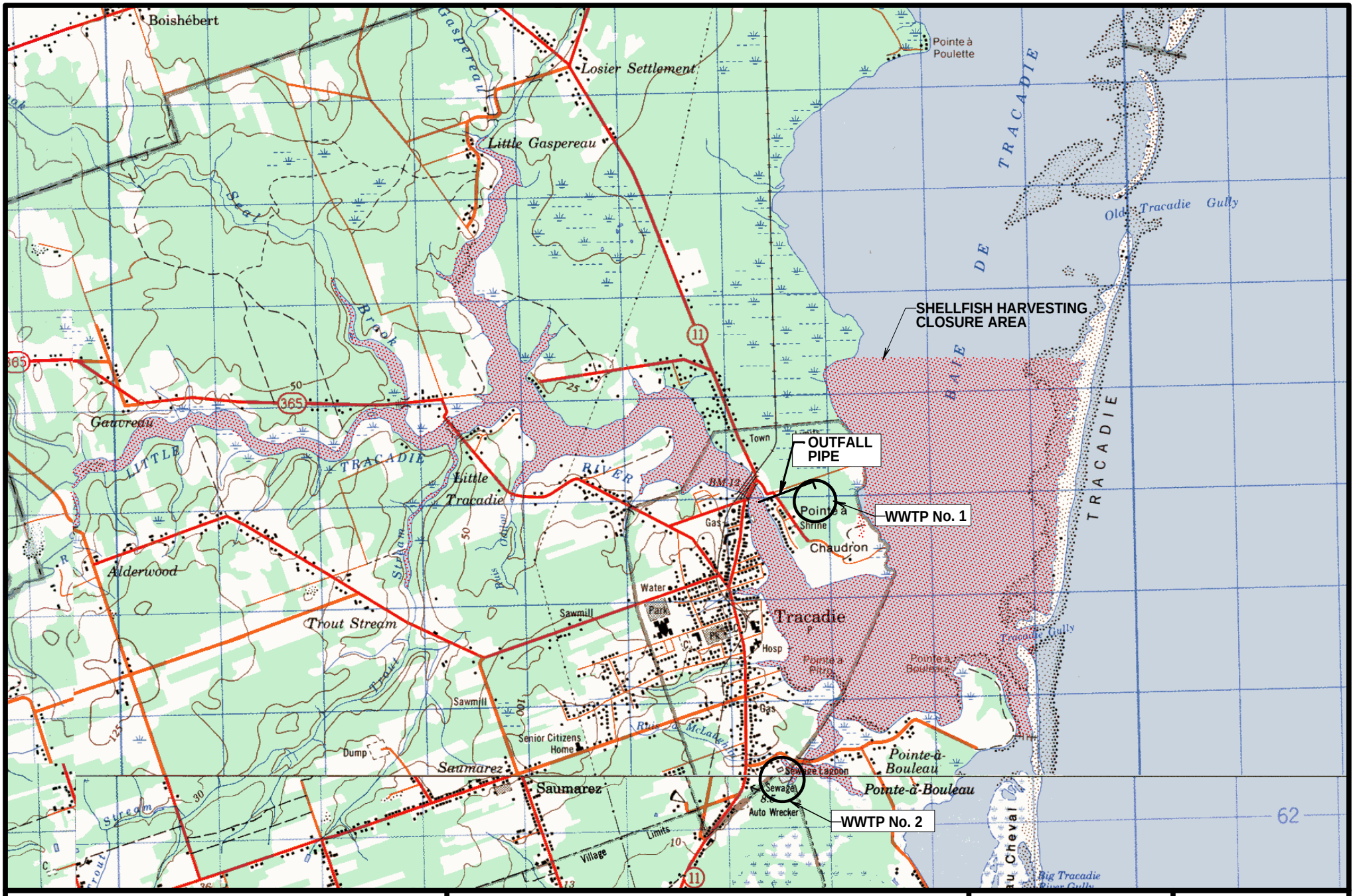
Parameter	Big Tracadie River at Murchy Bridge Station 01BL003	Little Tracadie River at Tracadie
Drainage area (km^2)	383	258 (1)
Flow regime	unregulated	unregulated
Average annual flow (L/s)	8,300	5,591
1:10 year - 7 day (7DQ10) low flow (L/s)	1,070 (2)	721

(1) From Comeau (2004)

(2) From Caissie et al. (2011)

Table 4.2. Characteristics of tidal water levels in Tracadie Bay, near Tracadie-Sheila (from Nautical Chart No. 4486), relative to chart datum (CD). The mean sea level is at 0.7 m above CD.

Parameter	Mean tides	Large tides
Low water level (m)	0.2	0.1
High water level (m)	1.3	1.7
Range (m)	1.1	1.6



ENVIRONMENTAL RISK ASSESSMENT

TRACADIE-SHEILA WWTP No. 1 - TOPOGRAPHIC MAP

WITH SHELLFISH HARVESTING CLOSURE AREA

NATECH

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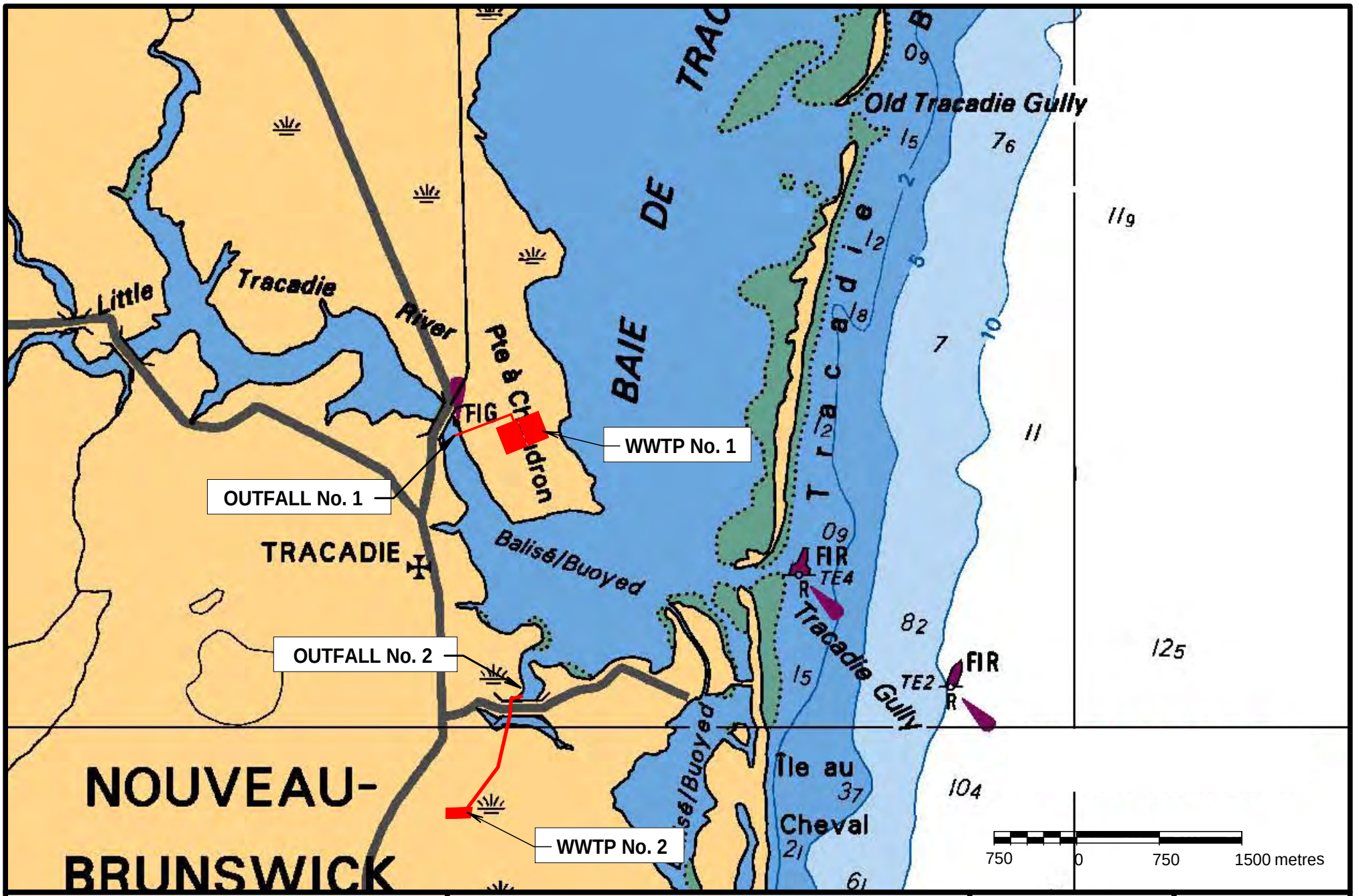
Scale: / Echelle:	**Sheet No.: / Nº de la feuille:**
1 KM GRID	FIGURE 4-1



ENVIRONMENTAL RISK ASSESSMENT
TRACADIE-SHEILA WWTP No. 1
HYDROGRAPHIC CHART

NATECH Environmental Services Inc.
2492 Route 640, Hanwell, NB E3E 2C2
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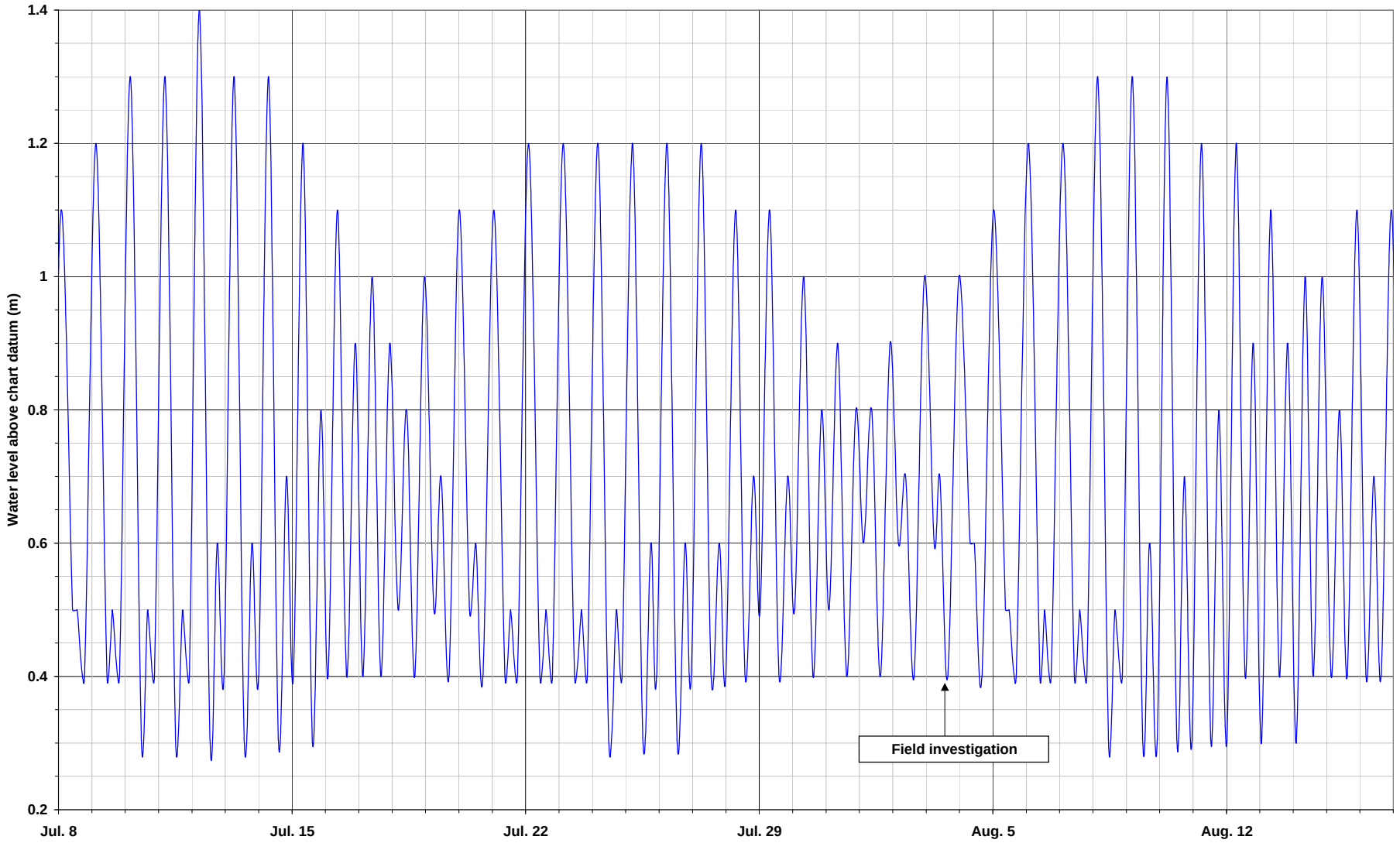
Scale: / Echelle:	Sheet No.: / Nº de la feuille:
AS SHOWN	FIGURE 4-2

Tracadie-Sheila - Predicted tidal water level changes in the summer of 2010 (Source: CHS)



Environmental Risk Assessment **Tracadie - Sheila WWTP No. 1** **Tidal water levels**	**NATECH Environmental Services Inc.** 2492 Route 640 Hanwell, NB, CANADA, E3E 2C2	**SCALE:** Not to scale	**DATE:** 2012/03/01
		FILE: RC-475-09	**FIGURE:** 4-3

4.2 Resource usage downstream

The outfall is located near a marina with a considerable amount of boat traffic in the estuary of the Tracadie River. There are also a number of private and public docks in the area. The potential for bodily contact with the water cannot be excluded. The tidal flats could be used for shellfish harvesting. However, large shoreline sections are closed to shellfish harvesting due to high bacteria counts in the water. Figure 4-1 shows the shellfish closure orders that are currently in effect in the area. To assess the potential environmental protection components, the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011), and the Canadian Recreational Water Quality Guidelines and Aesthetics (CCME, 1999) were consulted.

4.3 Background stream water quality

Data on the water quality of the Little Tracadie River and Tracadie Bay are available from Comeau (2004) and are summarised in Table 4.3.

Table 4.3. Background water quality data for the Little Tracadie River

Parameter	Unit	Location 1PT (1)	Location 2PT (1)
DO	mg/L	10.3	11.7
TSS	mg/L	2.4	0
NH_3-N Total	mg/L	0	0
Nitrate	mg/L	0.01	0.09
TP	mg/L	0.013	0.018
pH	units	7.5	7.6
Temperature	°C	12.3	10.3
E. Coli	MPN/ 100 mL	70	80
Arsenic	µg/L	0	0
Cadmium	µg/L	0	0
Chromium	µg/L	0	0

(1) From Comeau (2004). From an average of nine monthly sampling events (four from July to October 2002, and five from June to October 2003). The samples were taken upstream of the Tracadie-Sheila WWTP No.1, in Pont-Landry (1PT) four kilometres upstream, and Alderwood (2PT) seven kilometres upstream.

4.4 Field reconnaissance

The following conditions were observed during field work carried out on August 3, 2010:

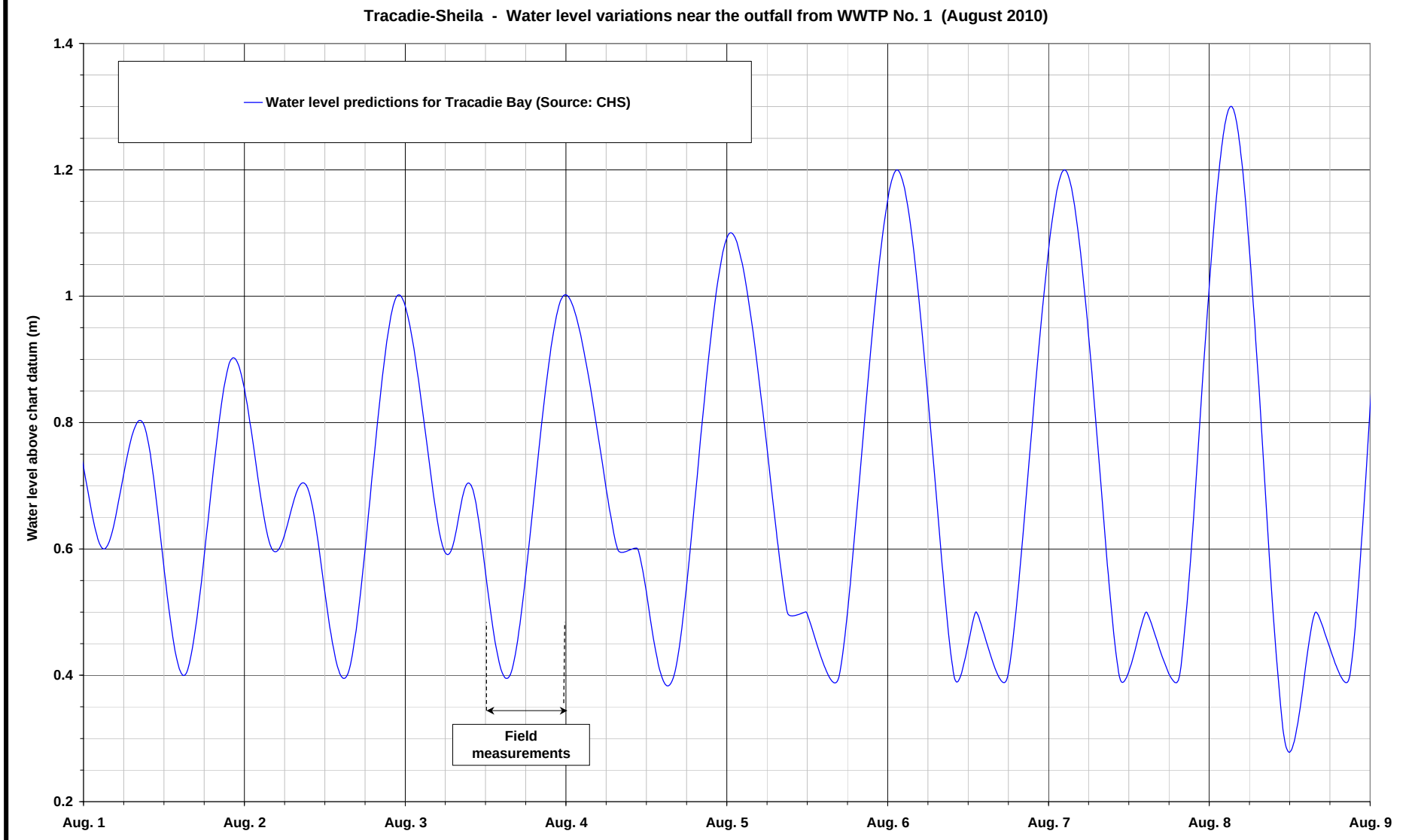
- The tidal range of the rising tide during the mixing zone measurements was 0.6 m (From 0.4 to 1.0 m above chart datum, see Figure 4-4). The freshwater flow in the Little Tracadie River was estimated to be 1,550 L/s during that time based on proration from the gauging station on the Big Tracadie River.

- Two drogues equipped with GPS tracking devices were released on the river at several times. Observed current velocities ranged from 0.06 to 0.08 m/s, in easterly direction. Figure 4-4 shows the recorded drogue paths and velocities. The drogue tracks indicate near-stagnant conditions during extended periods of time. The expected inland currents during a rising tide were not observed. It is possible that saline water was flowing inland at the bottom of the channel, while fresh water from the Little Tracadie River was pooling at the surface.

- The effluent flow at 16:30 was approximately 11.5 L/s (which would correspond to 1,000 m^3/day). A dye tracer (Rhodamine WT) was released into the effluent flow at 16:20. A batch of 1 L of dye was released. Figure 4-5 illustrates the shape of the observed mixing zone. The diluted effluent was found to split into two plumes, one following the shore, and the other part flowing faster to the south with the ebbing tidal current.

- Water quality measurements were taken in the effluent stream, as well as upstream and downstream of the outfall on August 3, 2010. Water samples were collected at the same locations and sent to an independent laboratory. The results are detailed in Tables 4.4 and Table 4.5.

- Photographs of the discharge are shown in Appendix A.



Environmental Risk Assessment
Tracadie - Sheila WWTP No. 1
Tidal water levels (2010)

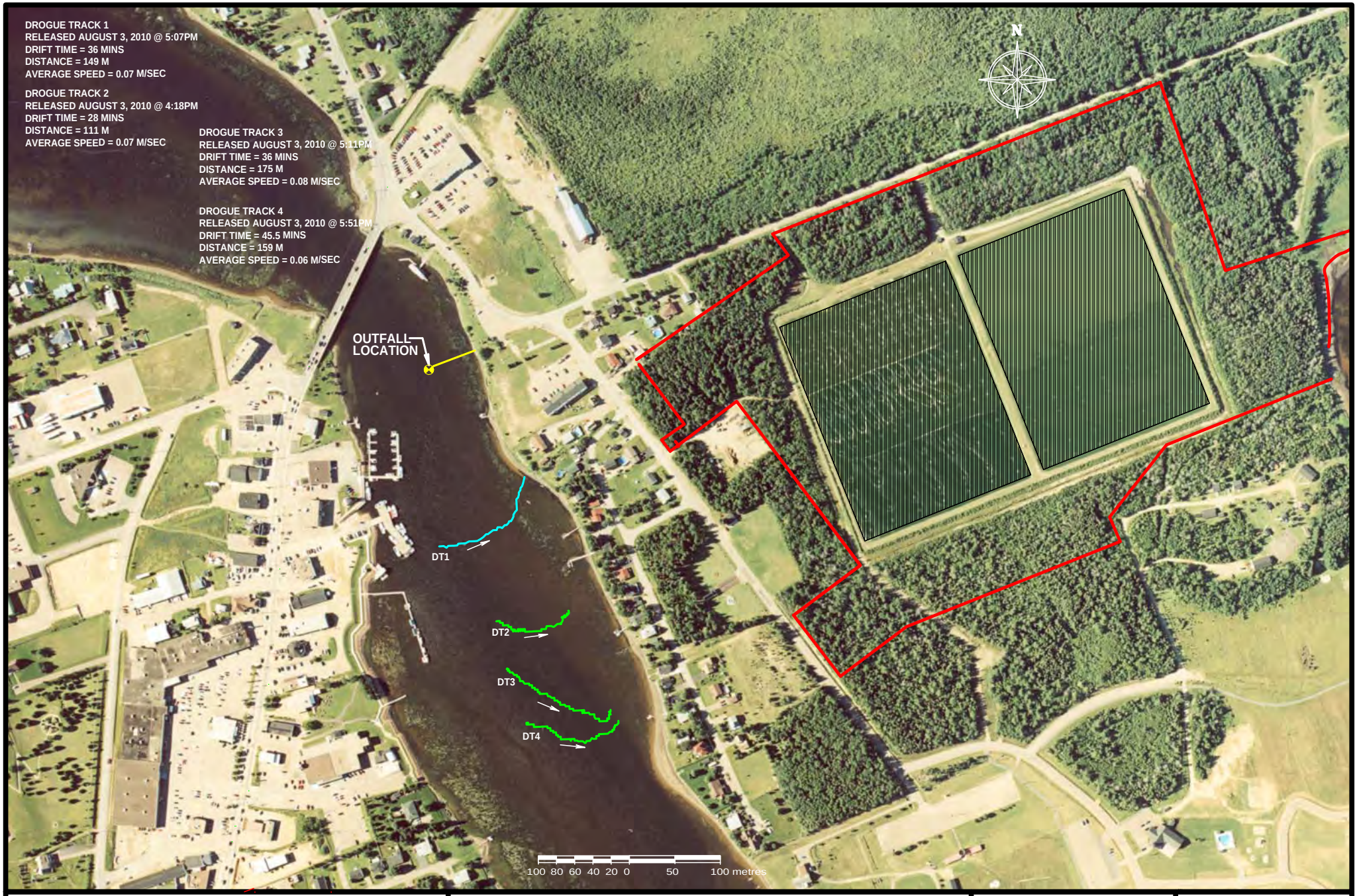
NATECH Environmental Services Inc.
2492 Route 640
Hanwell, NB, CANADA,
E3E 2C2

SCALE: Not to scale

DATE: 2012/03/01

FILE: RC-475-09-01

FIGURE: 4-4



ENVIRONMENTAL RISK ASSESSMENT

TRACADIE-SHEILA WWTP No. 1

MEASURED CURRENT VELOCITY ON AUGUST 3, 2010

NATECH

Environmental Services Inc.

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AS SHOWN	FIGURE 4-5

ENVIRONMENTAL RISK ASSESSMENT

TRACADIE-SHEILA WWTP No. 1

OBSERVED EFFLUENT DILUTION ON AUGUST 3, 2010

NATECH

Environmental Services Inc.

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Scale: / Echelle:	**Sheet No.: / Nº de la feuille:**
AS SHOWN	FIGURE 4-6

Table 4.4: Water quality of the receiving water body near the outfall, and the effluent, on August 3, 2010.

Parameter	Unit	Upstream	Effluent	Downstream
Field measurements				
Flow	L/s	approx. 1,550	15 L/s	approx. 1,565
DO	mg/L	9.7	8.2	9.1
pH	units	8.5	8.6	8.3
Temperature	°C	24.7	24.9	24.5
TDS	mg/L	11.2	0.5	11.8
Conductivity	mS/cm	17.3	0.8	18.1
Salinity	ppt	10.2	0.4	10.7 (1)
Laboratory analyses				
$CBOD_5$	mg/L	<5	<5	<5
TSS	mg/L	4	17	6
NH_3-N Total	mg/L	<0.07	5.79	<0.07
TKN	mg/L	15	35	<5
TP	mg/L	<0.08	3.86	<0.08
pH	units	8	8	7.8
E. Coli	MPN/ 100 mL	<2	70	7

(1) Measurement taken at the surface. The salinity was likely higher at a greater depth

Table 4.5. Tracadie-Sheila - Water quality of the receiving water body near the outfall, and the effluent, on August 3, 2010.

Parameter	Unit	Upstream	Effluent	Downstream
General chemistry				
CBOD5	mg/L	< 5	< 5	< 5
BOD5	mg/L	< 5	< 3	< 5
COD	mg/l	< 5	**45**	< 5
TSS	mg/L	**4**	**17**	**6**
Ammonia	mg/L	< 0.07	**5.8**	< 0.07
TKN	mg/L	**15**	**35**	< 5
Nitrate + Nitrite (as N)	mg/l	< 0.05	**0.33**	< 0.05
Nitrate (as N)	mg/l	< 0.05	**0.22**	< 0.05
Nitrite (as N)	mg/l	< 0.05	**0.11**	< 0.05
TP	mg/l	< 0.08	**3.86**	< 0.08
pH	N/A	**8.0**	**8.0**	**7.8**
Fluoride	mg/l	**0.76**	**0.91**	**0.80**
Microbiology				
E. coli	MPN/100mL	< 2	**70**	**7**
Total coliforms	MPN/100mL	**23**	**35 000**	**350**
Trace metals				
Aluminum	µg/L	**30**	**177**	< 20
Antimony	µg/L	< 2	**0.3**	< 2
Arsenic	µg/L	< 20	< 5	< 20
Barium	µg/L	**70**	**142**	**70**
Beryllium	µg/L	< 2	< 0.2	< 2
Bismuth	µg/L	< 20	< 2	< 20
Boron	µg/L	**1260**	**146**	**1340**
Cadmium	µg/L	< 0.2	**0.10**	< 0.2
Calcium	µg/L	**127000**	**63700**	**133000**
Chromium	µg/L	< 20	< 2	< 20
Cobalt	µg/L	< 2	**0.4**	< 2
Copper	µg/L	< 20	**5**	< 20
Iron	µg/L	**800**	**1030**	**700**
Lead	µg/L	< 2	**0.8**	< 2
Lithium	µg/L	47	**8.8**	50
Magnesium	µg/L	352000	**15100**	372000
Manganese		70	**251**	60
Mercury	µg/L	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	**3**	**1.1**	**3**
Nickel	µg/L	< 20	< 2	< 20
Potassium	µg/L	**110000**	**18600**	**116000**
Rubidium	µg/L	**30**	**13.2**	**33**
Selenium	µg/L	**40**	< 2	40
Silver	µg/L	< 2	< 0.2	< 2
Sodium	µg/L	**2910000**	**140000**	**3050000**
Strontium	µg/L	**2160**	**333**	**2340**
Tellurium	µg/L	< 2	< 0.2	< 2
Thallium	µg/L	< 2	< 0.2	< 2
Tin	µg/L	< 2	< 0.2	< 2
Uranium	µg/L	< 2	< 0.2	< 2
Vanadium	µg/L	< 20	< 2	< 20
Zinc	µg/L	< 20	**9**	< 20

5. INITIAL EFFLUENT CHARACTERIZATION PROGRAM - RESULTS

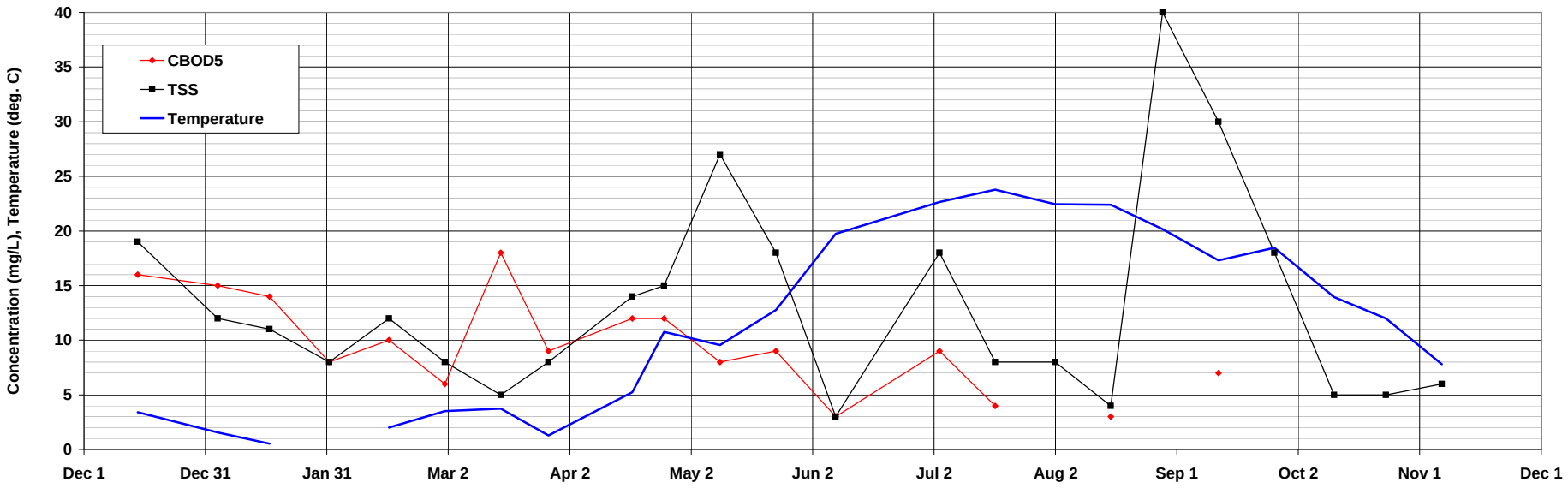
The data from the one-year monitoring program are summarised in Tables 5.1 to 5.4. Figure 5-1 details the variations of the parameters measured the most frequently in the effluent (every two weeks). The following observations were made:

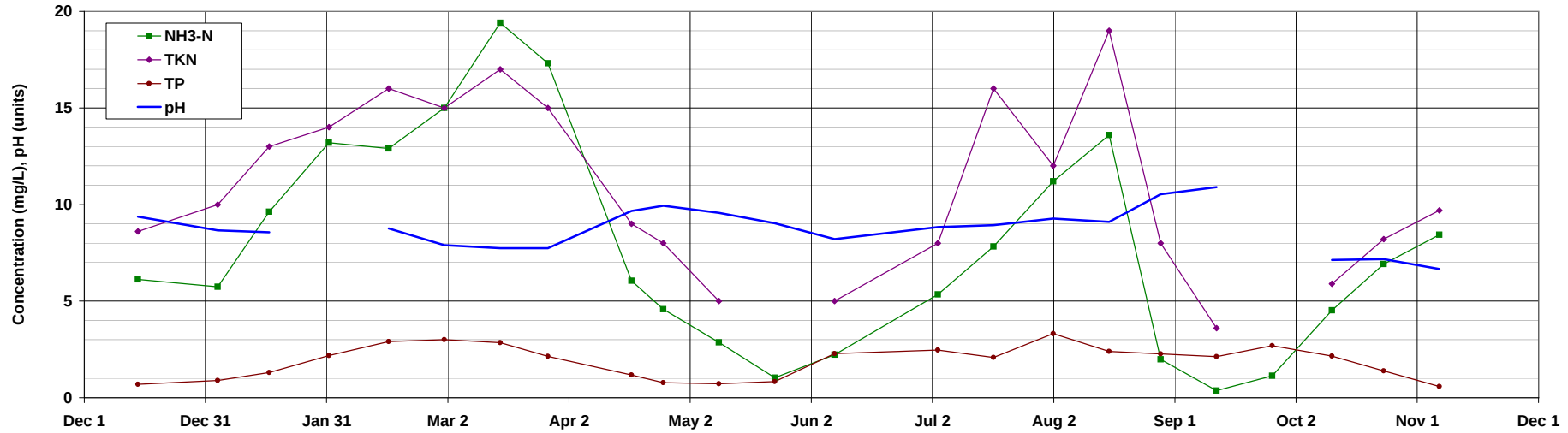
- ❏ $CBOD_5$ concentrations varied between 3 and 18 mg/L with an average of 10, which is well below the National Performance Standard of less than 25 mg/L.
- ❏ TSS concentrations varied between 3 and 40 mg/L with an average of 13. The TSS concentrations exceeded the National Performance Standard of less 25 mg/L once in May and twice at the end of the summer.
- ❏ Ammonia, TKN, and TP concentrations were at reasonable levels for a lagoon effluent.
- ❏ The pH ranged from 6.7 to 10.9 (average of 8.7).
- ❏ E. Coli varied between 10 and 15,500 MPN/100mL (average 2,300 MPN/100mL).
- ❏ Out of four sampling events, the effluent was found to be acutely toxic to Rainbow Trout once, and chronically toxic to Cerodaphnia Dubia twice,.
- ❏ Cadmium varied between less than 0.01 to 0.25 µg/L compared to a CCME water quality guideline* of 0.12 µg/L in seawater. Other metals either were not detected, were below the guideline concentration, or did not have a guideline value.
- ❏ No Pesticides, PCBs, PAHs, or VOCs were detected in the effluent
- ❏ Low concentrations of surfactants were detected twice out of four sampling events, but no guideline value is available for these substances.

*Canadian Guidelines for the Protection of Aquatic Life (CCME, 2011)

Table 5.1. WWTP effluent characteristics in 2011

Parameter	Unit	Min	Max	Average	Number of data
Plant data					
pH	units	6.7	10.9	**8.7**	21
Temperature	°C	0.5	23.8	**11.6**	22
Laboratory analyses					
$CBOD_5$	mg/L	3	18	**10**	17
TSS	mg/L	3	40	**13**	23
NH_3-N Total	mg/L	0.4	19	**8**	23
TKN	mg/L	3.6	19	**11**	21
TP	mg/L	0.6	3.3	**1.9**	23
E. Coli	MPN/ 100 mL	10	15,500	**2,300**	26
Parameter	**Unit**	**Jan.**	**Apr.**	**Jul.**	**Oct.**
Acute toxicity (Rainbow trout)	TU	<1	<1	<1	**1.1**
Acute toxicity (Daphnia magna)	TU	<1	<1	<1	<1
Chronic toxicity (Ceriodaphnia dubia)	TU	<1	<1	**1.8**	**1.6**





Environmental Risk Assessment
Tracadie - Sheila WWTP No. 1
Measured effluent quality in 2010-2011

NATECH Environmental Services Inc.
2492 Route 640
Hanwell, NB, CANADA,
E3E 2C2

SCALE: As shown

DATE: 2012/03/01

FILE: RC-475-09-01

FIGURE: 5-1

Table 5.2. Tracadie-Sheila WWTP No. 1 - Effluent characterization - General chemistry, Trace metals

Parameter	Unit	2011 Jan 18	2011 Apr 19	2011 Jul 19	2011 Oct 25
General chemistry					
COD	mg/l	**30**	**40**	**40**	**20**
Cyanide	mg/l	**0.002**	**0.003**	**0.003**	**0**
Fluoride	mg/l	**0.51**	**0.36**	**0.50**	**0.6**
Nitrate + Nitrite (as N)	mg/l	**0.65**	**0.36**	**0.32**	**0.3**
Nitrate (as N)	mg/l	**0.65**	**0.36**	**0.18**	**0.3**
Nitrite (as N)	mg/l	< 0.05	< 0.05	**0.14**	< 0.05
Phenols	mg/l	**0.004**	**0.004**	**0.004**	**0.002**
Trace metals					
Aluminum	µg/L	**30**	**42**	**25**	**84**
Antimony	µg/L	**0.3**	**0.1**	**0.1**	**0.1**
Arsenic	µg/L	**2**	**< 1**	**1**	**1**
Barium	µg/L	**102**	**98**	**94**	**80**
Beryllium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1
Bismuth	µg/L	< 1	< 1	< 1	< 1
Boron	µg/L	**92**	**41**	**48**	**65**
Cadmium	µg/L	**0.25**	**0.02**	**< 0.01**	**< 0.01**
Calcium	µg/L	**41600**	**28800**	**27300**	**32800**
Chromium	µg/L	**2**	< 1	< 1	**2**
Cobalt	µg/L	**0.3**	**0.2**	**0.1**	**0.2**
Copper	µg/L	**5**	**3**	< 1	**1**
Iron	µg/L	**400**	**560**	**250**	**380**
Lead	µg/L	**4.1**	**0.3**	**0.1**	**0.4**
Lithium	µg/L	**5.3**	**2.6**	**3.2**	**3.4**
Magnesium	µg/L	**17300**	**5010**	**4870**	**6240**
Manganese		**239**	**121**	**79**	**195**
Mercury	µg/L	< 0.025	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	**1.9**	**1.0**	**0.7**	**0.6**
Nickel	µg/L	**1**	< 1	< 1	**1**
Potassium	µg/L	**10800**	**4320**	**6170**	**7280**
Rubidium	µg/L	**6.7**	**3.2**	**5.3**	**5.4**
Selenium	µg/L	**2**	< 1	< 1	< 1
Silver	µg/L	< 0.1	< 0.1	< 0.1	< 0.1
Sodium	µg/L	**167000**	**65800**	**56300**	**61000**
Strontium	µg/L	**224**	**120**	**131**	**155**
Tellurium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	µg/L	**0.2**	< 0.1	< 0.1	< 0.1
Tin	µg/L	**0.2**	**0.1**	< 0.1	**0.3**
Uranium	µg/L	< 0.1	< 0.1	**0.1**	< 0.1
Vanadium	µg/L	**3**	< 1	< 1	< 1
Zinc	µg/L	**16**	**6**	**2**	**4**

Table 5.3. Tracadie-Sheila WWTP No. 1 - Effluent characterization - Pesticides, PCBs, PAHs

Parameter	Unit	2011 Jan 18	2011 Apr 19	2011 Jul 19	2011 Oct 25
Pesticides					
α-BHC	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
β-BHC	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
-BHC (Lindane)	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
δ-BHC	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Aldrin	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor epoxide	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDE	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan I	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDE	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Dieldrin	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDD	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDD	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDT	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endrin Aldehyde	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan Sulfate	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDT	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Endrin Ketone	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
Methoxychlor	ng/mL	< 0.01	< 0.01	< 0.01	< 0.01
PCBs					
Total PCBs	µg/L	< 0.1	< 0.1	< 0.1	< 0.1
PAHs					
Naphthalene	µg/L	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Indenopyrene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	< 0.01	< 0.01	< 0.01	< 0.01

Table 5.4. Tracadie-Sheila WWTP No. 1 - Effluent characterization - VOCs, surfactants

Parameter	Unit	2011 Jan 18	2011 Apr 19	2011 Jul 19	2011 Oct 25
VOCs					
Chloromethane	µg/L	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	µg/L	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	µg/L	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorofluoromethane	µg/L	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethylene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Methylene Chloride	µg/L	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethylene (trans)	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethylene (cis)	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,1,1-Trichloroethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethylene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloropropane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,3-Dichloropropylene (trans)	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	µg/L	< 0.5	0.9	< 0.5	< 0.5
1,3-Dichloropropylene (cis)	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,1,2-Trichloroethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethylene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Dibromochloromethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dibromoethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
m,p-Xylenes	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Styrene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,1,1,2-Tetrachloroethane	µg/L		< 0.5	< 0.5	< 0.5
1,1,2,2-Tetrachloroethane	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,3-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,4-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
Surfactants					
CTAS Surfactants	mg/l	**0.7**	< 0.5	< 0.5	< 0.5
MBAS Surfactants	mg/l	**0.2**	**0.2**	< 0.1	< 0.1

6. DETERMINATION OF EFFLUENT DISCHARGE OBJECTIVES (EDOs)

6.1 Determination of Environmental Quality Objectives (EQOs)

Guideline values for relevant water quality parameters are summarised in Table 6.1. Only parameters for which a meaningful guideline value could be found, were listed in this table. The guideline values were obtained from the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011) for estuarine and marine waters, and the Canadian Recreational Water Quality Guidelines and Aesthetics (CCME, 1999).

Table 6.1 Environmental Quality Objectives (EQOs) for Tracadie-Sheila WWTP No.1

Parameter	Unit	EQO
DO	mg/L	DO >8.0 (1)
TSS	mg/L	<5 to <25 above background (2)
NH_3-N Total	mg/L	<1.1 (3)
TKN	mg/L	<0.55 (4)
Nitrate	mg/L	<16
TP	mg/L	<0.055 (5)
pH	units	7.0 - 8.7
E. Coli	MPN/100mL	<200 (6)
Faecal coliforms	MPN/100mL	<14 (7)
Arsenic	µg/L	<12.5
Cadmium	µg/L	<0.12
Chromium	µg/L	<1.5 (Chrome VI), <56 (Chrome III)
Mercury	µg/L	<0.016
Endosulfan (Pesticide)	µg/L	<0.002 long-term, <0.09 short term
Naphtalene (PAH)	µg/L	<1.4
Benzene (VOC)	µg/L	<110
Toluene (VOC)	µg/L	<215
Ethylbenzene (VOC)	µg/L	<25
1,2 Dichlorobenzene (VOC)	µg/L	<42
Acute toxicity	TU	<1 at end of pipe
Chronic toxicity	TU	<1 at edge of mixing zone

TU = toxicity unit

(1) **Dissolved oxygen:**

Marine/estuarine waters: "The recommended minimum concentration of DO in marine and estuarine waters is 8.0 mg/L. Depression of DO below the recommended value should only occur as a result of natural processes. When ambient DO concentrations are >8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time." From Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011)

(2) **Suspended sediments:**

Clear flow : Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).

High flow: Maximum increase of 25 mg·L-1 from background levels at any time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when background is >250 mg/L. From Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011)

(3) **Ammonia:**

Marine/estuarine waters: There is no recommended guideline for marine aquatic life from CCME. The following values for total NH_3-N were determined based on values used in BC (Nordin, 2001), assuming a salinity of 30 ppt, a sea temperature of 20 deg. C, and a pH of 8.0 in the Little Tracadie River estuary:

<1.1 mg/L average 5 to 30-day concentration, and <7.3 mg/L maximum concentration

(4) **Total Kjeldahl Nitrogen:**

A maximum concentration of 0.55 mg/L for nitrogen was chosen based on the mean guidelines proposed by Bricker et al (1999) for a medium degree of over-enrichment in estuarine waters (CCME, 2007).

(5) **Total Phosphorus:**

A maximum concentration of 0.055 mg/L for phosphorus was chosen based on the mean guidelines proposed by Bricker et al (1999) for a medium degree of over-enrichment in estuarine waters (CCME, 2007).

(6) **E. coli:** 200 MPN/100 mL from Recreational Water Quality Guidelines and Aesthetics (CCME, 1999)

(7) **Faecal coliforms:**

"Shellfish growing waters are considered polluted when the faecal coliform densities exceed a median of 14/100 mL (based on 15 data points). By comparison the standard for drinking water is 0 FC/100 mL while swimming water standard is 200 FC/100mL. The stringent standard for shellfish growing water is necessary due to the filter feeding mechanism of bivalve shellfish which can concentrate bacteria" (DFO, 2011)

6.2 Determination of the mixing zone and assessment of dilution

6.2.1 Assessment of average and worst-case scenarios

The following conditions were used to assess the **average-case scenario**:

- ❑ An average annual flow of 5,591 L/s in the Little Tracadie River, a mean tidal water level in the estuary (0.7 m above chart datum), and an average ambient current (0.2 m/s)

- ❑ An average effluent discharge of 40 L/s (3,460 m^3/day).

The following conditions were used to assess the **worst-case scenario**:

- ❑ The 7DQ10 low flow of 721 L/s in the Little Tracadie River, a low tidal water level in the estuary (0.1 m above chart datum), and very little ambient current (0.02 m/s)

- ❑ The dry weather effluent discharge of 27 L/s (2,330 m^3/day).

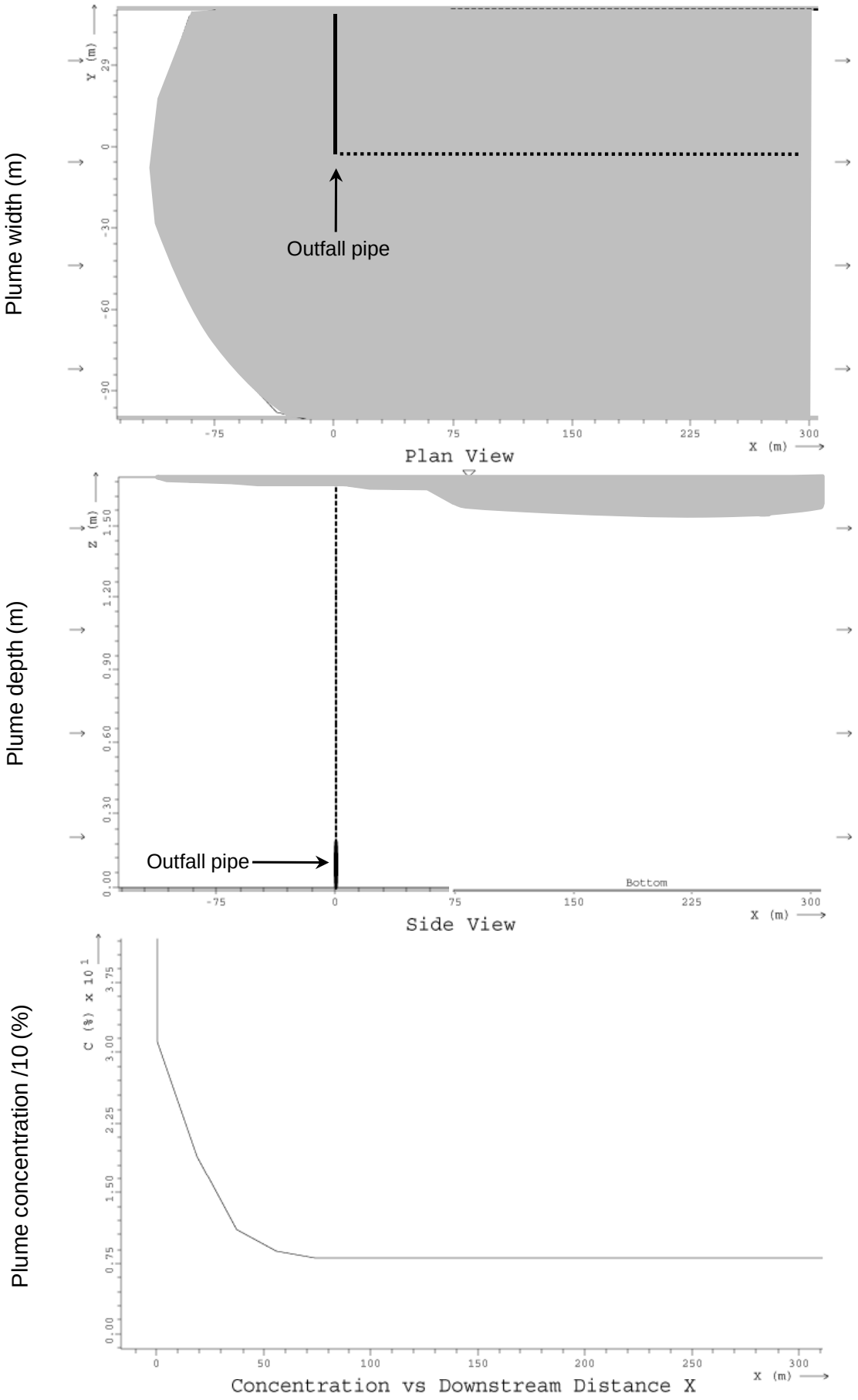
6.2.2 Modeling

After mixing into the Little Tracadie River, the effluent eventually finds its way into Tracadie Bay, which is partially enclosed by a barrier of sand bars and dunes. Consequently, the long-term effluent mixing regime is complex. The mixing is influenced by a number of variables including the inflow of freshwater, flushing rates of sea water, wind intensity and direction, water depth, the nature of the substrate, and the stratification of the water column. The dilution of the effluent into the freshwater flow of the Little Tracadie River alone is 1 in 28 in the worst-case scenario, and 1 in 141 in the average scenario (based on the flows listed in section 6.2.1). The Cormix model was used to simulate the effluent dilution rates in the estuary for both scenarios. Assumptions used and resulting predictions are listed in Table 6.2. The model predicts that a dilution of 1 in 12 would be achieved at the edge of the near-field mixing zone 75 m downstream in the worst-case scenario, and 1 in 33 (11 m downstream) in the average scenario. Figure 6-1 illustrates the predicted shape of the effluent plume in the worst-case scenario. The plume rises quickly to the surfaces and spreads over a large area while remaining at the surface.

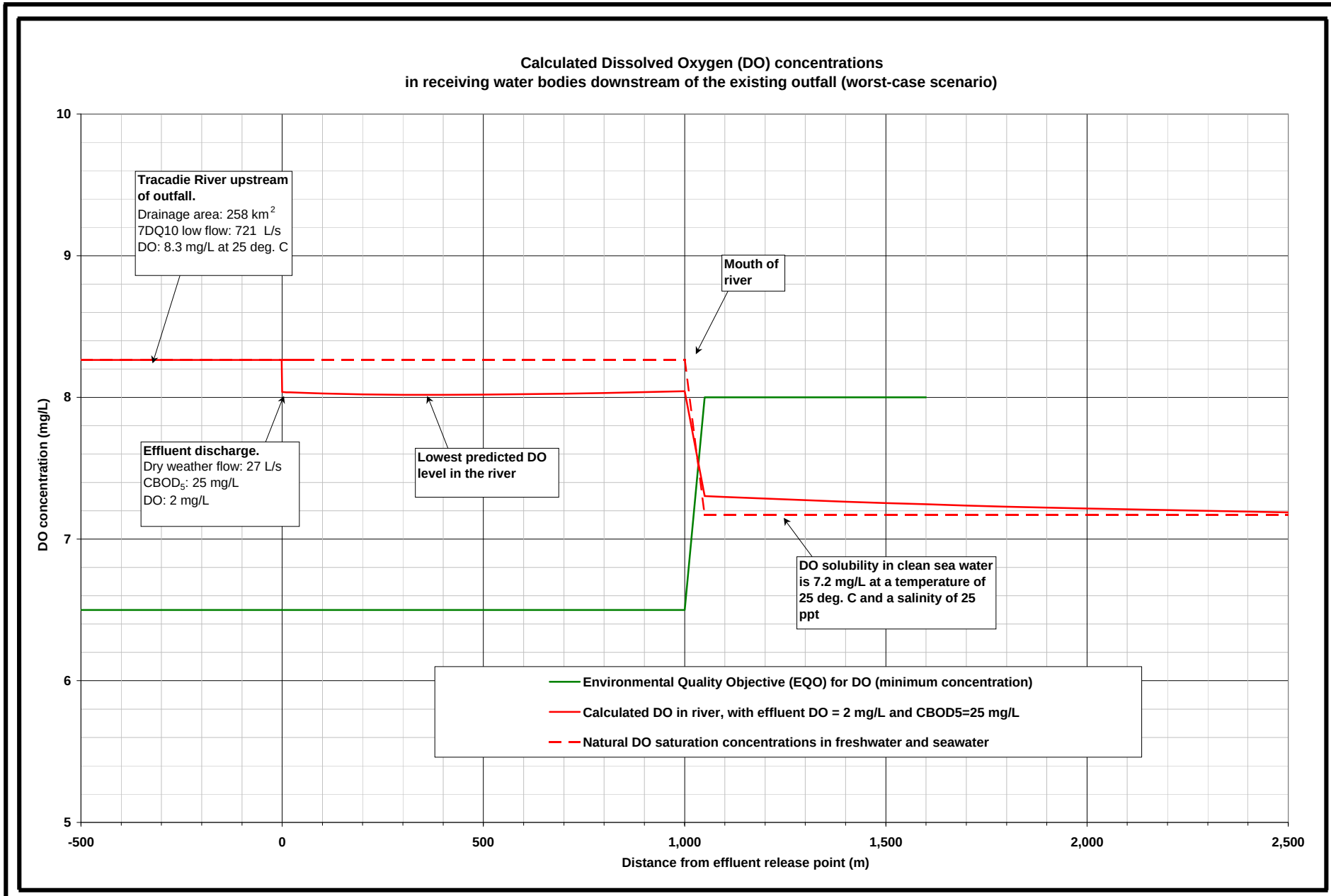
Dissolved oxygen (DO) depletion is detrimental to aquatic life. The EQO for DO in freshwater is typically 6.5 mg/L, and 8.0 mg/L in seawater. The Streeter-Phelps algorithm was used to simulate oxygen depletion downstream of the outfall based on the organic content of the effluent. An effluent $CBOD_5$ of 25 mg/L and an effluent residual DO concentration of 2 mg/L were assumed, as well as a water temperature of 25°C in the estuary. The DO in the river is predicted to decrease by 0.3 mg/L a few hundred metres downstream of the outfall, to just above 8.0 mg/L. Figure 6-2 illustrates that once the effluent mixes with the seawater one kilometre downstream, the DO level in Tracadie Bay is predicted to be reduced. This reduction is not caused by the effluent, but is due to the fact that the natural saturation concentration of oxygen in seawater is only 7.2 mg/L at a salinity of 25 ppt and a temperature of 25°C. In summary, no significant DO depletion is predicted due to the effluent in the saline part of the estuary.

Table 6.2. Cormix assumptions and results for various scenarios.

Parameter	Unit	Field conditions	Average case	Worst case
CORMIX assumptions				
Receiving water:				
Receiving depth at outfall	m	1.95	2.3	1.7
Ambient current speed	m/s	0.07	0.2	0.02
Receiving water salinity	ppt	10	10	20
Outfall:				
Total effluent flow	L/s	12	40	27
Diameter	m	0.2		
Distance from shore	m	50		
Effluent exit velocity	m/s	0.4	1.3	0.9
Effluent salinity	ppt	0		
CORMIX results				
Near-field mixing zone				
Effluent concentration	%	5.6	3.1	8.3
Effluent dlution	**1 in**	**18**	**33**	**12**
Plume length	m	25	11	75
Plume width	m	21	5	150
Distance to 1:10 dilution	**m**	**2**	**6**	**45**
Plume width	m	4	2	135
Plume thickness	m	0.40	0.60	0.05



Environmental Risk Assessment Tracadie-Sheila WWTP No.1 CORMIX simulation Worst-case scenario	NATECH **Environmental Services Inc.** **2492 Route 640, Hanwell, N.B.** **ph: (506) 455 1085, fax: (506) 455 1088**	Figure 6-1



Environmental Risk Assessment **Tracadie-Sheila WWTP No. 1** **DO deficit model predictions**	**NATECH Environmental Services Inc.** 2492 Route 640 Hanwell, NB, CANADA, E3E 2C2	**SCALE:** Not to scale	**DATE:** 2012/3/2
		FILE: RC-475-09	**FIGURE:** 6-2

6.2.3 Allocated mixing zones

The extent of a mixing zone varies with each water quality parameter. For potentially toxic parameters, dilutions should be calculated for the edge of the near-field mixing zone. The near-field mixing zone is the part of the water body where the energy contained in the effluent (mainly momentum and buoyancy) is dissipating, constituting the main cause of effluent dilution. In the far-field, effluent dilution is solely dependent on transport and dispersion by the ambient current. Most effluent constituents exhibit their strongest impact in the near-field where their concentrations are the highest. Some parameters, such as CBOD and nutrients (nitrogen and phosphorus) have effects on downstream water quality at a larger distance from the outfall. The following parameter-specific allocated mixing zones are recommended:

- For $CBOD_5$ and TSS: the CCME Strategy specifies end-of-pipe criteria (minimum National Performance Standards) of less than 25 mg/L for both substances. In this case, the Standards appear sufficient to ensure that there will be no significant impact on the receiving environment due to $CBOD_5$ and TSS. The effluent is predicted to cause little oxygen depletion in the estuary (see details in modeling section). With regards to TSS, a 1 in 5 dilution is needed to meet the EQO, and this dilution typically occurs close to the outfall, before the effluent reaches the surface

- For TKN and TP: a one kilometre long mixing zone is recommended, from the outfall to the mouth of the river. This is the area where the effluent becomes fully mixed into the surface layer of fresh water from the Tracadie River. These freshwater flows tend to remain on top of the denser, tidal seawater flowing underneath. The effluent dilution rate is predicted to be 1 in 28 at the edge of the mixing zone under the worst-case scenario.

- For all other parameters: the near-field mixing zone is recommended (up to 75 m downstream of the discharge). At the edge of this zone, the predicted dilution is 1 in 12 under the worst-case scenario.

6.3 Determination of EDOs

The Effluent Discharge Objectives (EDOs) in Table 6.3 below are calculated based on the Environmental Quality Objectives (EQOs) in Table 6.1, the dilutions available at the edge of the allocated mixing zones, and background concentrations in the receiving water body.

Table 6.3: Proposed EDOs for Tracadie-Sheila WWTP No.1

Parameter*	Unit	Assumed back-ground	EQO (1)	Alloca-ted MZ	Dilution at edge of MZ	Calculated EDO for effluent
$CBOD_5$	mg/L	0	DO > 8	-	-	<25 (2)
TSS	mg/L	5	<5 or <25	-	-	<25 (2)
NH_3-N Total	mg/L	0	<1.1	75 m	12	<13
Nitrate	mg/L	0	16	75 m	12	<192
TKN	mg/L	0.1	<0.55	1 km	28	<13
TP	mg/L	0.015	<0.055	1 km	28	<1.1
pH	mg/L	8	7.0 - 8.7	75 m	12	6.0 - 9.7
E. Coli	MPN/ 100 mL	75	<200	75 m	12	<1,600
Faecal coliforms	MPN/ 100 mL	>14	<14	75 m	12	<14
Arsenic	µg/L	0	<12.5	75 m	12	<150
Cadmium	µg/L	0	<0.12	75 m	12	<1.4
Chromium	µg/L	0	<1.5	75 m	12	<18
Mercury	µg/L	0	<0.016	75 m	12	<0.19
Endosulfan	µg/L	0	<0.002	75 m	12	<0.024
Naphtalene	µg/L	0	<1.4	75 m	12	<17
Benzene	µg/L	0	<110	75 m	12	<1,320
Toluene	µg/L	0	<215	75 m	12	<2,580
Ethylbenzene	µg/L	0	<25	75 m	12	<300
1,2Dichlorobenzene	µg/L	0	<42	75 m	12	<500
Acute toxicity	TU	0	<1	none	none	< 1
Chronic toxicity	TU	0	<1	75 m	12	<12

(1) From Table 6.1

(2) The Minimum National Performance Standards of less than 25 mg/L mentioned in the CCME Strategy appear sufficient to avoid negative impact on the receiving environment due to $CBOD_5$ and TSS.

7. SELECTION OF SUBSTANCES FOR COMPLIANCE MONITORING

The CCME strategy requires that continuous monitoring is conducted after the initial effluent characterization is completed:

7.1 Selection of substances

- ❑ $CBOD_5$ and TSS must be monitored regardless of the initial characterization results.

- ❑ All substances with mean effluent values greater than 80% of their EDO. In this case ammonia, TKN, TP, E. Coli, and Faecal Coliforms should be monitored. The effluent pH and temperature should be measured along with ammonia to determine the actual ammonia toxicity.

- ❑ For a “medium” size facility such as the Tracadie-Sheila WWTP No. 1, regular monitoring of acute and chronic toxicity is required by the CCME Strategy.

7.2 Monitoring frequencies

Table 7.1 lists the recommended substances for compliance monitoring and their monitoring frequencies.

Table 7.1. Compliance monitoring requirements for Tracadie-Sheila WWTP No. 1

Parameter	**Sampling Frequency**	**Procedure**
$CBOD_5$	Every two weeks	Sampled by operator, analysed by laboratory
TSS		
NH_3-N Total		
TKN		
TP		
E. Coli		
Faecal coliforms		
pH		Measured by operator
Temperature		
Acute toxicity (Rainbow trout and Daphnia magna)	Quarterly	Sampled by operator, analysed by laboratory
Chronic Toxicity (Ceriodaphnia dubia)		

8. CONCLUSIONS AND RECOMMENDATIONS

The effluent from the Tracadie No. 1 wastewater treatment plant (WWTP) is discharged into the estuary of the Little Tracadie River. The outfall is located 50 m from the shore in a channel that is approximately two metres deep at low tide. During the field measurements, it was observed that saline tidal water and fresh water from the river do not completely mix in the outfall area. It is likely that density stratification occurs, which results in a complex mixing process of the effluent into the receiving water. In spite of this density stratification, the effluent was found to break through the halocline and rise to the surface during the field measurements in August of 2010. Once the effluent reaches the surface, dilution occurs relatively quickly. Surface currents do not always follow the denser, more saline bottom currents, and the effluent plume can stay in the area longer than anticipated based on a water balance, alone.

The measured annual average daily wastewater flow from December 2010 to November 2011 was 3,460 m^3/day (40 L/s). The peak flow during the period was 6,770 m^3/day (78 L/s), and the dry weather flow was approximately 2,330 m^3/day (27L/s). The measured effluent flows are higher than anticipated. This excess is likely due to significant inflow and infiltration into the municipal sewer system. Sources of infiltration and inflow should be identified and eliminated. A reduction of effluent flows would allow for less stringent Effluent Discharge Objectives (EDOs) for some of the water quality parameters of concern.

The effluent quality in 2011 was typical of a lagoon effluent. Average $CBOD_5$ and TSS concentrations were usually below the National Performance Standard of less than 25 mg/L. TSS levels were elevated at the end of the summer, possibly due to algae growth in the lagoons. The effluent was found to be either acutely or chronically toxic twice out of four sampling events.

The calculated Effluent Discharge Objectives (EDOs) are less than 25 mg/L for $CBOD_5$ and TSS, less than 13 mg/L for total ammonia and TKN, less than 1.1 mg/L for TP, less than 2,400 mg/L for E. Coli, and less than 14 mg/L for Faecal Coliforms. Additional EDOs were calculated for nitrates, some metals, a pesticide, some VOCs, and toxicity, based on the available water quality guidelines (see Table 6.3). Only the parameters listed in Table 7.1 are required to be monitored regularly in the future.

Sufficient aeration should be provided to ensure that ammonia concentrations do not exceed the EDO in the summer, as the toxic form of ammonia (unionized ammonia or NH_3) is present in higher concentrations when the water is warmer. TKN and TP should also be kept as low as possible in the summer when eutrophication is the most likely to occur.

The receiving water is used for recreational purposes, both contact and non-contact. Also, the potential for fishing and shell fish harvesting exists in the area. Currently, large sections of the estuary are closed to shell fish harvesting. In order to meet the water quality target for bodily contact, E. Coli concentrations in the effluent should be less than 1,600 MPN/100 mL. If areas near the outfall should be re-opened to shell fish harvesting, the effluent should contain less than 14 counts of Faecal Coliforms per 100 mL. It should be noted that there are other sources of bacterial contamination which prevent shell fish harvesting areas from being opened. The installation of a disinfection system is recommended for the Tracadie WWTP No. 1. UV lights may be a better alternative than chlorination. If chlorination was used, dechlorination would have to be provided as well. Also, the CCME Strategy requires daily compliance monitoring of total residual chlorine in the effluent.

If infiltration and inflow were reduced, the plant should be able to accommodate the effluent from WWTP No. 2 in Sheila (7 L/s average flow), in order to suppress the discharge into the sensitive environment there (the Mc Laughlin Brook estuary). There would be a small additional $CBOD_5$ and TSS loading (less than 25 mg/L for each), and a normal nutrient loading from that effluent stream. Further study would be required in terms of nutrient modeling in the estuary of the Little Tracadie River.

9. REFERENCES

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10. GLOSSARY

A

Acutely Lethal *(Létal aigu)*

At 100 percent concentration of effluent, more than 50 percent of the test species subjected to it over the test period are killed when tested in accordance with the acute lethality test set out in the appropriate method. For rainbow trout this is Reference Method EPS 1/RM/13.

Allocated Mixing Zone *(Zone de mélange allouée)*: see mixing zone

Ammonia *(Ammoniac)*

Total ammonia expressed as nitrogen. Total ammonia means the sum of the unionized ammonia (NH_3) and ionized ammonia (NH_4+) species which exist in equilibrium in water. Analytical methods measure and typically report on ammonia nitrogen as opposed to total ammonia. The unionized ammonia (NH_3) is toxic to fish in low concentrations. The amount of NH_3 is calculated as a fraction of the total nitrogen, based on temperature and pH.

C

Canadian Environmental Quality Guidelines *(Recommandations canadiennes pour la qualité de l'environnement)*

Nationally endorsed, science-based goals for the quality of atmospheric, aquatic, and terrestrial ecosystems. Environmental quality guidelines are defined as numerical concentrations or narrative statements that are recommended as levels that should result in negligible risk to biota, their functions, or any interactions that are integral to sustaining the health of ecosystems and the designated resource uses they support. Developed by CCME.

Carbonaceous Biochemical Oxygen Demand (CBOD5, 5-day) ***(Demande biochimique en oxygène des matières carbonées [DBO5C, 5 jours])***

A measure of the quantity of oxygen used in the biochemical oxidation of organic matter in 5 days, at a specific temperature, and under specified conditions. The method of analysis is defined by Method 5210 in Standard Methods. The CBOD is a fraction of the total BOD. This fraction is specific to each effluent.

Chronic Toxicity ***(Toxicité chronique)***

The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism. Chronic toxicity results in reduced reproductive capacity or reduced growth of young, in fish or invertebrate populations.

Combined Sewer ***(Égout unitaire)***

A sewer intended to receive both sanitary waste and storm water.

Combined Sewer Overflow (CSO) ***(Débordement d'égout unitaire [DEU])***

A discharge to the environment from a combined sewer system that occurs when the hydraulic capacity of the combined sewer system has been exceeded, usually as a result of rainfall and/or snow melt events.

D

Designated Area ***(Zone désignée)***

Sensitive areas as identified by the regulator and that may be affected by municipal wastewater discharges, such as fish spawning sites, beaches, drinking water intakes, etc.

E

Effluent Discharge Objective (EDO) ***(Objectif environnemental de rejet [OER])***

Concentration, load or toxicity units that should be met at the municipal wastewater effluent discharge to adequately protect all water uses in the receiving environment. Effluent discharge objectives are obtained through an environmental risk assessment methodology using the principles of assimilative capacity and mixing zone, in conjunction with environmental quality.

Environmental Quality Objective (EQO) ***(Objectif de qualité de l'environnement [OQE])***

Concentration of a substance considered safe for aquatic life and for the human uses that exist or should exist outside of a determined mixing zone. The ***Canadian Environmental Quality Guidelines*** (CEQG) are generic EQOs often used in Canada. The numerical concentrations or narrative statements that establish the conditions necessary to support and protect the most sensitive designated use of water at a specified site (CCME, 1987)

Environmental Risk Assessment (ERA) ***(Évaluation des risques environnementaux [ERE])***

A procedure that will enable the establishment of effluent discharge objectives for substances of concern. This process will take into account the characteristics of the effluent and of the site-specific receiving environment. The environmental risk assessment includes a one-year period where a facility will characterize its effluent (initial characterization).

Eutrophication: Excessive growth of aquatic vegetation in response to elevated concentrations of nutrients (often associated with wastewater discharges).

M

Mixing Zone *(Zone de mélange)*
Also called the initial dilution zone. The area contiguous with a point source (effluent discharge site) or a delimited non-point source where the discharge mixes with ambient water and where concentrations of some substances may not comply with water quality guidelines or objectives. For the purpose of the Strategy, “mixing zone” means the “allocated mixing zone” at the edge of which environmental quality objectives should be met.

N

Near-Field Mixing Zone The volume of water between the end of the discharge pipe or the diffuser nozzle, and the point where the energy (mainly momentum and buoyancy) of the effluent has dissipated. Beyond this point - in the far-field - river or coastal current transport takes over.

Nutrient *(Élément nutritif)*
Any substance that is assimilated by organisms and promotes growth; generally applied to nitrogen and phosphorus in wastewater, but also to other essential and trace elements.

R

Receiving Environment *(Milieu récepteur)*
The water body into which effluent is discharged.

S

Streeter Phelps algorithm: A method of predicting oxygen depletion in a receiving water body as a function of organic loadings and existing background condition.

APPENDIX A - Photographs

Tracadie Lagoons

Tracadie Lagoons

Tracadie Lagoons

Outfall area

Environmental Risk Assessment

Tracadie WWTP No. 1

Photographs

Environmental Services Inc.
2492 Route 640, Hanwell, N.B., E3E 2C2
ph: (506) 455 1085, fax (506) 455 1088

DATE: 2010/08/31

FILE: RC-475-09-01

SCALE: -

FIGURE: A1

Outfall area

Drogue

Effluent plume with dye tracer

Dye tracer

Environmental Risk Assessment

Tracadie WWTP No. 1

Photographs

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2492 Route 640, Hanwell, N.B., E3E 2C2
ph: (506) 455 1085, fax (506) 455 1088

DATE: 2010/08/31

FILE: RC-475-09-01

SCALE: -

FIGURE: A2

APPENDIX F:

Tracadie Municipal Plan Map

Ville De Tracadie-Sheila

Carte du plan de zonage

Légende

Zones

Résidentielles	
- unifamiliales	RA
- uni et bifamiliales	RB
- uni, bi et multifamiliales	RC
- de maison mobiles	RM
Mixtes	M
Mixtes avec permis d'alcool	M-1
Commerciales	
- centre-ville	C1
- routicres	C2
- de services	C3
Institutionnelles	INS
Industrielles centrales	I1
Aménagement integré	AI
Naturelles	N
Chalets	CH
De protection des puits	A , B , C
De protection	P

Utilisation du sol

Résidentielle	
- unifamiliale	
- bifamiliale	
- multifamiliale	
Maison mobile	
Commerciale	
Institutionnelle	
Industrielle	
Chalet	
Terrain a bleuet	
Terrain agricole	
Parc et espaces verts	
Contraintes des sols	
Tourbicre	
Mauvais a trcs mauvais drainage	
Terre inondable	

PITA = Programme d'identification des terres agricoles

Commission d'aménagement de la Péninsule acadienne

149 boul. St-Pierre ouest, Caraquet, N.-B., tél : 727-7979, tlec : 727-7990

Analyste en géomatique Richard Servant	Vérifié et approuvé par : Joey Thibodeau (urbaniste)
Annexe << A >>	Date : le 2 juillet 2002

échelle = 1: 8000

0m 400 800 1200 mètres