DILLON
CONSULTING

NEW BRUNSWICK POWER CORPORATION

Environmental Impact Assessment (EIA) Registration

Nepisiguit Falls Generating Station Life Extension Project
Bathurst Mines, New Brunswick

December 2021 – 20-3641

1149 Smythe Street
Suite 200
Fredericton
New Brunswick
Canada
E3B 3H4
Telephone
506.444.8820
Fax
506.444.8821

December 10, 2021

New Brunswick Department of Environment and Local Government
Environmental Impact Assessment Branch
P.O. Box 6000
20 McGloin Street, 3rd Floor
Fredericton, NB
E3B 5H1

Attention: Ms. Crystale Harty
Acting Director, Environmental Impact Assessment Branch

RE: Environmental Impact Assessment (EIA) Registration: Nepisiguit Falls Generating Station Life Extension Project, Bathurst Mines, New Brunswick

Dear Ms. Harty:

On behalf of the New Brunswick Power Corporation (NB Power), Dillon Consulting Limited (Dillon) is pleased to submit this environmental impact assessment (EIA) registration document for the proposed Nepisiguit Falls Generating Station Life Extension Project (the Project) in Bathurst Mines, New Brunswick, for your review and consideration.

Dillon looks forward to your timely review of the documentation. Please contact the undersigned if you have any questions or require additional information.

Sincerely,

DILLON CONSULTING LIMITED

Denis L. Marquis, M.Sc.E., P.Eng.
Associate, Project Manager

DLM:trw
Attachment: EIA Registration
cc: Christina LaFlamme – NB Power

Our file: 20-3641

Dillon Consulting Limited

Table of Contents

Figures

Tables

Appendices

List of Acronyms and Units

Acronym or Unit	Definition
a.m.	morning
AC CDC	Atlantic Canada Conservation Data Centre
AFRP	archaeological field research permit
AHB	Archaeology and Heritage Branch
AIA	archaeological impact assessment
ANB	Ambulance New Brunswick
ARD	acid rock drainage
ATV	all-terrain vehicle
Blvd.	boulevard
BMI	benthic macroinvertebrate
Boreal	Boreal Environmental
BP	(years) before present
°C	degrees Celsius
C&D	construction and demolition
ca.	*circa* (meaning approximately)
CAC	criteria air contaminant
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CE	common era
CEPA	*Canadian Environmental Protection Act*
cfs	cubic feet per second
CH_4	methane
cm	centimetre
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRM Group	Cultural Resource Management Group Ltd.
CWQG	Canadian Water Quality Guidelines

Acronym or Unit	Definition
CWS	Canadian Wildlife Service
dBA	A-weighted decibels
DFO	Department of Fisheries and Oceans Canada
Dillon	Dillon Consulting Limited
DO	dissolved oxygen
e.g.,	*exempli gratia* (meaning "for example")
ECCC	Environment and Climate Change Canada
EIA	environmental impact assessment
ESA	Environmentally Sensitive Area
ESC	erosion and sedimentation control
et al.	*et alia* (meaning "and others")
etc.	*et cetera* (meaning "and so forth")
FAA	*Fisheries Act* authorization
FES	fabric encapsulated soil
FWAL	freshwater aquatic life
GCDWQ	Guidelines for Canadian Drinking Water Quality
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
H_2S	hydrogen sulphide
ha	hectare
HADD	harmful alteration, disruption, or destruction (of fish habitat)
i.e.	*id* est (meaning "in other words" or "that is")
IA	impact assessment
IAA	*Impact Assessment Act*
IBA	Important Bird Area
IK	Indigenous knowledge
IPCC	Intergovernmental Panel on Climate Change
km	kilometre
km^2	square kilometre
km/h	kilometres per hour

Acronym or Unit	Definition
kPa	kiloPascals
kWh	kiloWatt-hours
L	litre
L/min	litres per minute
LAA	local assessment area
Leq	equivalent sound pressure level
LLC	limited liability corporation
Lmax	maximum sound pressure level
LOO	Licence of Occupation
LSD	Local Service District
m	metre
m^2	square metre
m^3/s	cubic metres per second
m amsl	metres above mean sea level
MBBA	Maritimes Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act*
m bgs	metres below ground surface
mg/L	milligrams per litre
ML	metal leaching
mm	millimetre
Mt	megatonne (metric)
MTI	Mi'gmawe'l Tplu'taqnn Incorporated
MW	megaWatt
MWh	megaWatt-hours
N_2O	nitrous oxide
NAAQO	National Ambient Air Quality Objectives
NB	New Brunswick
NBDELG	New Brunswick Department of Environment and Local Government
NBDNRED	New Brunswick Department of Natural Resources and Energy Development
NBDTHC	New Brunswick Department of Tourism, Heritage and Culture
NBDTI	New Brunswick Department of Transportation and Infrastructure

DILLON CONSULTING

Acronym or Unit	Definition
NB Power	New Brunswick Power Corporation
NB SARA	New Brunswick *Species at Risk Act*
NO_x	nitrogen oxides
NTU	nephelometric turbidity unit
OINR	outside-to-inside noise reduction
OWLS	online well log system
p.m.	evening
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PDA	Project development area
pg.	page
pH	a measure of the acidity or alkalinity of a substance
PID	parcel identifier
PM	total particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
PNA	Protected Natural Area
pp.	pages
ppm	parts per million
PSEMP	Project-specific Environmental Management Plan
RCMP	Royal Canadian Mounted Police
RCNM	Roadway Construction Noise Model
RFA	recreational fishing area
RPAS	remotely piloted aircraft system
RPC	Research and Productivity Council
RSC	Regional Service Commission
SAR	species at risk
SARA	*Species at Risk Act*
SO_2	sulphur dioxide
SOCC	species of conservation concern
t	tonne (metric)

Acronym or Unit	Definition
TLRU	traditional land and resource use
TOC	total organic carbon
TRC	Technical Review Committee
TSP	total suspended particulate
TSS	total suspended sediments
$\mu g/m^3$	micrograms per cubic metre
UNFCCC	United Nations Framework Convention on Climate Change
µS/cm	microSiemens per centimetre
U.S.A.	United States of America
VC	valued component
WAWA	watercourse and wetland alteration
WHO	World Health Organization
WMZ	wildlife management zone
WNNB	Wolastoqey Nation in New Brunswick

1.0 Introduction

This document is an Environmental Impact Assessment (EIA) Registration document for the Nepisiguit Falls Generating Station Life Extension Project (the Project) proposed by the New Brunswick Power Corporation (NB Power) in the community of Bathurst Mines, Gloucester County, New Brunswick, Canada. The Nepisiguit Falls Generating Station (the Station) is a 10.8 megaWatt (MW) hydroelectric generating station located on the Nepisiguit River, in northern New Brunswick.

The Project is an "undertaking" under items (b) and (i) of Schedule A of the New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act* (EIA Regulation) ["*(b) all electric power generating facilities with a production rating of three megawatts or more"* and "*(i) all causeways and multiple-span bridges"*]. As such, the Project must be registered under Section 5(1) of the EIA Regulation, and at minimum a determination review will be conducted. Following the EIA review and approval, other permits and approvals at the federal and provincial levels will be required.

This EIA Registration document is submitted to the New Brunswick Department of Environment and Local Government (NBDELG) under Section 5(2) of the New Brunswick *Environmental Impact Assessment Regulation* 87-83 of the *Clean Environment Act*. It has been prepared by Dillon Consulting Limited (Dillon) on behalf of NB Power to provide information to the NBDELG and its associated Technical Review Committee (TRC) to assist in the EIA review of the Project.

1.1 Proponent Information

The Project may be referred to as the "Nepisiguit Falls Generating Station Life Extension Project". The proponent of the Project is the New Brunswick Power Corporation. The Proponent's contact information is provided in **Table 1.1.1** below.

Table 1.1.1: Proponent Information

Name of Project:	Nepisiguit Falls Generating Station Life Extension Project
Name of Proponent:	New Brunswick Power Corporation (NB Power)
Mailing Address of Proponent:	515 King Street P.O. Box 2000 Fredericton, NB E3B 4X1
Chief Executive Officer:	Keith Cronkhite

Table 1.1.1.: Proponent Information (Continued)

Proponent's Contact Person for the purposes of this EIA Registration:	Christina LaFlamme, M.Sc. EIA Specialist Tel: 506.458.6658 Email: CLaflamme@nbpower.com Website: https://www.nbpower.com/en/about-us/projects/nepisiguit-life-extension-project Project-specific Email: NepisiguitProject@nbpower.com
Environmental Consultant that led the preparation of this EIA Registration:	Denis L. Marquis, M.Sc.E., P.Eng. Associate, Project Manager Dillon Consulting Limited 1149 Smythe Street, Suite 200 Fredericton, NB, Canada E3B 3H4 Tel.: 506.444.8820 ext. 5119 Mobile: 506.454.8846 Email: dmarquis@dillon.ca
Other contributors to the preparation of this EIA Registration	• Boreal Environmental (Wildlife, Vegetation, and Wetland Surveys) • Cultural Resource Management Group Ltd. (Archaeological Impact Assessment)

1.2 About the Nepisiguit Falls Generating Station

The Nepisiguit Falls Generating Station (the Station) is located at Nepisiguit Falls, in the rural area of Bathurst Mines, approximately 30 kilometres (km) south of Bathurst, Gloucester County, in northern New Brunswick. The Station is encompassed within parcel identifier (PID) No. 20872263 owned by NB Power; PID No. 20378907 is also associated with the Station but is owned by the Government of New Brunswick (refer to **Figure 1.2.1**). The Station's powerhouse is located at approximate coordinates 47° 24' 19.25" N and 65° 47' 30.76" W, at an elevation of approximately 107.5 m above mean sea level (m amsl).

Operation of the Station began in 1921. It was originally known as the Great Falls Generating Station. It was built to provide power to the corrugated pulp and paper mill in Bathurst which had a number of owners over the years but was last owned by Smurfit-Stone Container Corporation (Smurfit-Stone). Smurfit-Stone decided in 2005 to divest its ownership of the Station after the pulp and paper mill was permanently closed.

As outlined in CDA (2008), on June 29, 2007, NB Power announced its purchase of the Great Falls Hydro Generating Station from Smurfit-Stone. The Station was renamed the Nepisiguit Falls Generating Station to avoid confusion with the Grand Falls Generating Station located in Grand Falls, Victoria County, New Brunswick, which is also owned by NB Power.

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

PROJECT LOCATION

FIGURE 1.2.1

Project Location

Road

Watercourse

Waterbody

0 45 90 180 meters

SCALE 1:5,500

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-08-27

The purchase was finalized in 2008, and NB Power has continued to maintain and upgrade the operating equipment to current safety and operational standards, including a partial refurbishment of some dam components in 2012 following a provincial and federal environmental assessment review. The Station currently operates with approximately seven employees (NB Power 2020).

The Station is built atop a natural waterfall on the Nepisiguit River called Nepisiguit Falls (also known as the Great Falls or Grand Falls). The Station has three Francis-type turbine-generator units, each with a rated nameplate capacity of 3.6 MW, for a total Station capacity of 10.8 MW. Currently, the maximum output is limited to 10.2 MW. The first two units were commissioned in 1921, and the third unit was commissioned in 1929 (NB Power 2020).

As detailed in CDA (2008), the Station consists of two concrete dams built at the crest of a naturally-occurring waterfall overlooking a deeply incised gorge. The two concrete dams are equipped with inflatable rubber bladders (known as the forebay bladder and the sluiceway bladder) that sit atop the concrete dam structures. These two dams/bladders control the water level in the impoundment area. The forebay bladder consists of a 1.2 m diameter inflatable rubber bladder that is used to increase water elevations in the forebay beyond those that would occur with the concrete dam alone. The sluiceway bladder consists of a 4.8 m bladder that is situated in the sluiceway and is used to retain water in the forebay during normal operation or for spilling water during periods of maintenance of flood conditions. Behind the forebay dam, water flows into the powerhouse structure via the penstocks that are integrated into the powerhouse concrete structure. The penstock for each unit passes water through to the associated turbine-generator unit to generate electricity. From the turbine-generator units, the water then travels through the draft tubes, and discharges via the tailrace into a narrow gorge at the base of the Station. The total head of the facility is approximately 30 m and the average annual generation is approximately 52 million kiloWatt-hours (kWh). This is enough electricity to provide power to approximately 3,000 homes per year (CDA 2008).

Other components of the Station include a forebay, forebay spillway dam, spillway and submerged gate, two rubber bladder dams, main dam and sluiceway, powerhouse containing turbine-generator units and electrical generating equipment, access road, a multi-span bridge, and associated electrical terminal and transmission facilities (refer to **Figure 1.2.2**).

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

NEPISIGUIT FALLS GENERATING STATION FACILITIES

FIGURE 1.2.2

Road

Waterbody

0 15 30 60 meters

SCALE 1:2,000

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: AS
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-08-27

1.3 The Undertaking

A high-level description of the Undertaking is presented in this section.

1.3.1 Project Overview (Nature of the Undertaking)

NB Power is undertaking a multi-faceted life extension project at the Station to extend its service life by approximately another 50 years. The Project consists of various components aimed at modernizing, repairing, and/or replacing various components at the Station in phased approach between 2022 and approximately 2030. The Project components include one or more of the following:

- Phase 1 – Turbine-Generator Unit Replacements: Replacement of one or more of the three aging turbine-generator units at the Station with modern DIVE-HAX-Turbines;
- Phase 2 – Forebay Bridge Replacement or Repair: Repair or replacement of the forebay bridge, the original multi-span riveted design bridge that extends from the north shore of the river to the centre platform that contains the air compressors needed to inflate the two bladders. The multi-span bridge extends across the Nepisiguit River over the impoundment area;
- Phase 3 – Sluiceway Bladder and Forebay Bladder Replacements: Replacement of the two rubber bladder dams that sit atop the concrete dam structure whose purpose is to raise water elevations in the impoundment compared to with the concrete dam structure alone; and
- Phase 4 – Structural Repairs to the Powerhouse, Forebay, and Tailrace Concrete Structures: Conducting structural repairs to one or more walls of the powerhouse's building envelope, forebay, and other components.

1.3.2 Rationale and Need for the Project

Hydroelectric generating stations began increasing in popularity on rivers in North America and around the world in the late 19th Century as a means of generating electricity in an increasingly modernized world. Many of these early hydroelectric generating stations in North America including the Nepisiguit Falls Generating Station are nearing or have reached the end of their useful service life, and either need to be refurbished to extend their life or to be decommissioned. Though it is at times uneconomical or unfeasible to refurbish some aging hydroelectric generating stations to extend their lives, that is not the case with the Nepisiguit Falls Generating Station. Conversely, in the case of NB Power's Milltown Generating Station in St. Stephen, New Brunswick that is currently undergoing an EIA for its decommissioning and removal, it is not economical or feasible to extend its life. Provided it can be done in an economically viable manner, maintaining hydroelectric generating stations in active service is generally favoured over their decommissioning since the electricity they generate is often profitable on a per-kWh basis, in addition to being from a renewable energy source.

NB Power has a diverse mix of generation resources and power purchase agreements. The utility serves the electric needs of the province with hydro, nuclear, oil, coal, wind, natural gas, biomass, and solar resources. Over 40% of New Brunswick's energy requirements currently come from renewable energy sources. Combining those with the Point Lepreau Nuclear Generating Station, over 75% of New Brunswickers' electrical energy needs are being serviced by carbon-free sources.

Renewable energy sources such as hydroelectric power are increasingly valuable as society works to meet its energy demands while reducing greenhouse gas emissions that lead to global climate change. The Project is part of NB Power's approach to meet its commitment to generate 40% of its electrical power from renewable energy sources, as mandated by the New Brunswick *Electricity from Renewable Resources Regulation – Electricity Act*, as well as for NB Power to position itself for a future reduced carbon economy. With renewed interest by governments and society about climate change, and with regulatory mechanisms (e.g., carbon pricing) being developed to combat climate change, electric utilities throughout North America are increasingly interested in new, non-emitting, renewable energy sources to meet societal demands for electricity.

In this light, the Nepisiguit Falls Generating Station Life Extension Project has the primary objective of extending the operational life of the Station by approximately 50 years (i.e., until approximately 2075) and restoring, and ultimately increasing the overall generating capacity of this facility so as to provide a stable source of renewable energy well into future. The restoration of generating capacity at the Station will provide value by increasing its nameplate generating capacity by up to approximately 22% while reducing the emission of air contaminants that would otherwise be generated from conventional fossil-fuel generation sources.

1.3.3 Project Purpose

In consideration of the above, the purpose of the Project is to refurbish certain components and systems at the Nepisiguit Falls Generating Station to extend its service life and maintain its ongoing operation by approximately 50 years, until approximately 2075. This supports NB Power's goals of ensuring clean, reliable electricity for New Brunswickers at low and stable rates.

1.3.3.1 Alternatives to the Project

In consideration of the Project purpose as stated in **Section 1.3.3** above, there are no alternatives to the Project that would meet the Project purpose.

1.4 Regulatory Context

The potential environmental regulatory frameworks that may apply to the Project at the federal, provincial, and local levels are discussed at a high level below.

1.4.1 Environmental Impact Assessment Legislation

The potential regulatory frameworks relating to potential provincial environmental impact assessment or a federal impact assessment requirements that might apply to the Project are discussed below.

1.4.1.1 New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act*

The New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act*, administered by the NBDELG, establishes the EIA process in New Brunswick. The EIA Regulation requires that all "undertakings" listed on Schedule A of the EIA Regulation (including their proposed construction, operation, modification, extension, abandonment, demolition, or rehabilitation) require registration at minimum. Schedule A of the EIA Regulation defines 24 categories of undertakings that may trigger the need for an EIA Registration, and the following categories listed in Schedule A apply to the Project:

- *"(b) all electric power generating facilities with a production rating of three megawatts or more"* (for the physical modifications that will be associated with the Project); and
- *"(i) all causeways and multiple-span bridges*".

The requirements for EIA review of a registration document are described in the document titled "A Guide to Environmental Impact Assessment in New Brunswick" (referred to herein as the "EIA Guide"; NBDELG 2018).

1.4.1.2 Government of Canada's *Impact Assessment Act*

The Government of Canada enacted the *Impact Assessment Act* (IAA) in August 2019 to supersede the former *Canadian Environmental Assessment Act, 2012* (CEAA 2012) that was previously in force to govern federal environmental assessments in Canada. The IAA, as administered by the Impact Assessment Agency of Canada (the Agency), defines the federal impact assessment (IA) process for projects that encompass "Designated Physical Activities" and projects carried out on federal land. Designated Physical Activities are those listed in the *Physical Activities Regulations* under the IAA, which includes 61 types of activities under 10 project categories. The construction, operation, and decommissioning and abandonment of a hydroelectric generating station with a production capacity of 200 MW or more, or the expansion thereof by more than 50%, are listed on the *Physical Activities Regulations*, and any facility exceeding these thresholds would be a Designated Physical Activity under the IAA that would require a federal IA.

Based on the *Physical Activities Regulations*, the nature of the Nepisiguit Falls Station itself, and the Project activities as they are currently conceived, there are no features of the Project that are considered a Designated Physical Activity under the IAA since the Station is far less than 200 MW in production capacity defined in the *Physical Activities Regulations*. Therefore, an impact assessment under the IAA is not required for the Project.

1.4.2 Other Potential Federal, New Brunswick, and Local Legislation

In addition, the other potential provincial, federal, and local environmental permitting requirements that may apply to the Project are summarized in **Table 1.4.1**.

Table 1.4.1: Potential Provincial, Federal, and Local Environmental Permitting Requirements

Legislation	Nature of Permit/Approval/ License/Authorization	Required for the Project?	Applicability/Relevance to the Project
Provincial			
Clean Environment Act	*Environmental Impact Assessment Regulation:* EIA Registration.	Yes.	EIA registration (likely limited to the determination review level) is required, since the Project involves the modification of a generating station with a production capacity of 3 MW or more. While at the Minister's sole discretion, a comprehensive review is unlikely to be required.
Clean Environment Act	*Water Quality Regulation*: • Water Quality Approval to Construct; and • Water Quality Approval to Operate.	No.	An Approval under the *Water Quality Regulation* is not believed to be required because the Station is not considered a "source" of contaminants to the waters of the province.
Clean Water Act	*Watercourse and Wetland Alteration Regulation*: Watercourse and Wetland Alteration (WAWA) Permit Application.	Yes.	A WAWA permit is required for work within 30 metres (m) of a watercourse or wetland before commencement of the Project.
Clean Air Act	*Air Quality Regulation*: • Air Quality Approval to Construct; and • Air Quality Approval to Operate.	No.	An Approval under the *Air Quality Regulation* is not believed to be required because the Station is not considered a "source" of contaminants to the atmosphere.
Crown Lands and Forests Act	Land use, ownership, commercial and industrials activities permit application(s).	Yes.	PID No. 20378907 is a parcel of land administered by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED), and as such a Licence of Occupation (LOO) is required.

Legislation	Nature of Permit/Approval/ License/Authorization	Required for the Project?	Applicability/Relevance to the Project
Provincial (Continued)			
Heritage Conservation Act	Archaeological Field Research Permit for carrying out archaeological investigations.	Yes.	A Professional Archaeologist must obtain an Archaeological Field Research Permit prior to carrying out archaeological investigations.
	Site Alteration Permit for any alteration of registered archaeological sites.	Possibly.	A Site Alteration Permit is required for any alterations within 100 m of registered archaeological sites, should any be present.
Quarriable Substances Act	Permits for the extraction/processing of minerals in the Province.	No.	Should the Project involve excavation on-site or at unapproved borrow sources on Crown land, a permit may be required before the commencement of that activity.
Federal			
Impact Assessment Act (IAA)	Impact Assessment.	No.	A federal impact assessment is not required since the Project is below the thresholds for a designated physical activity and is not located on federal land.
Fisheries Act	*Fisheries Act* Authorization and Offsetting Plan.	Likely. To be confirmed in consultation with Fisheries and Oceans Canada (DFO).	For temporary or permanent in-water works only that are determined by DFO result in harmful alteration, disruption or destruction of fish and fish habitat (DFO 2019). The temporary dewatering of the impoundment, construction of cofferdams, and physical works within the watercourse will likely require an authorization and likely related offsetting (to be confirmed with DFO).

Legislation	Nature of Permit/Approval/ License/Authorization	Required for the Project?	Applicability/Relevance to the Project
Federal (Continued)			
Canadian Navigable Waters Act	Permit Application.	Likely. To be confirmed in consultation with Transport Canada.	For in-water works only that result in the disruption of navigation and related activities.
Species at Risk Act (SARA)	Authorization/additional protection measures outlined by Environment and Climate Change Canada (ECCC)/Canadian Wildlife Service (CWS).	Not likely.	For Project works that would cause the unavoidable destruction or harm to species at risk and/or their critical habitat.
Migratory Birds Convention Act (MBCA)	Authorization/additional protection measures outlined by ECCC/CWS.	Not likely.	For Project works that would cause the unavoidable destruction or harm to migratory birds and/or their nests, or for work conducted between April 14 and August 28 (nesting zone C4 for northern New Brunswick) that may disturb or harass migratory birds, their eggs, their chicks, or their nests.
Local			
Community Planning Act	Building permits, demolition approval, heritage approval, possible other permits from the Regional Service Commission.	No.	As a provincial Crown corporation, NB Power is not subject to local requirements.

1.5 Purpose and Organization of this Document

The purpose of this EIA Registration document is to provide information to the NBDELG and its TRC as part of its review of the environmental effects of the Project in accordance with the EIA Regulation. The EIA Registration document provides a description of the Project, describes existing environmental conditions, identifies mitigation to be employed to minimize the environmental effects of the Project, and characterizes residual environmental effects of the Project after mitigation and best management practices have been applied.

This EIA Registration document is organized in 13 chapters, as follows:

- Chapter 1 provides an introduction to the Project, including proponent information, a Project overview, the purpose, rationale, need for the Project, and an overview of the applicable regulatory framework;
- Chapter 2 provides a high-level description of the Project as currently conceived, and describes how the Project will be carried out. Emissions and wastes from the Project are also described;
- Chapter 3 provides an overview of the environmental setting of the Project;
- Chapter 4 provides information on the scope of the EIA, and the methods that were used to evaluate the potential interactions between the Project and the environment;
- Chapter 5 provides the assessment of potential interactions between the Project and the environment, on various valued components (VCs) of the environment that are of relevance and importance to this EIA Registration, for each applicable Project phase;
- Chapter 6 provides an assessment of potential effects of the environment on the Project;
- Chapter 7 provides an assessment of accidents, malfunctions, and unplanned events;
- Chapter 8 describes planned Indigenous consultation activities in respect of the Project;
- Chapter 9 provides a description of planned public and stakeholder engagement activities in respect of the Project;
- Chapter 10 provides other information relevant to the EIA Registration to meet the requirements of the NBDELG's EIA Guide (NBDELG 2018);
- Chapter 11 provides a summary of the EIA Registration, and resulting conclusions;
- Chapter 12 provides closing remarks; and
- Chapter 13 provides the references and personal communications cited in this EIA Registration document.

Additional supporting information is provided in the appendices to this EIA Registration document.

2.0 Project Description

This section provides a high-level description of the activities that will be required to complete the Project and its related Project components, as currently conceived and based on the available information at the time of writing. Engineering design for the Project and its related components is underway, and is likely to evolve as Project planning and engineering design is completed. So as to not understate the potential environmental consequences of the Project or its components at this planning stage, the Project description provided in this Section presents an “outer envelope”, or conservative estimate, of the scope, footprint, and anticipated environmental effects of the Project and its components and activities. The Project will ultimately be constructed and operated such that the resulting environmental effects remain within the outer envelope as presented in this EIA Registration.

The key aspects of the Project are described below, including:

- A brief description of the Project and its components as well as the general site of the Project;
- The activities that will be carried out during unit replacements, forebay bridge replacement/repair, bladder replacements, and structural repairs;
- The planned Project schedule; and
- Project-related emissions and wastes.

2.1 Project Location

The Station is located at Nepisiguit Falls, in the rural area of Bathurst Mines, approximately 30 km south of Bathurst, Gloucester County, in northern New Brunswick. The Station is encompassed within parcel identifier (PID) No. 20872263 owned by NB Power; PID No. 20378927 is also associated with the Station but is owned by the Government of New Brunswick. The Station’s powerhouse is located at geographic coordinates 47° 24’ 19.25” N and 65° 47’ 30.76” W, at an elevation of approximately 107.5 m amsl. The land directly associated with the Station covers an area of approximately 40.2 hectares (ha). In addition, NB Power owns a submerged water lot of the Nepisiguit River with an approximate area of 1.8 ha. The subject and neighbouring properties are shown on **Figure 2.1.1** below.

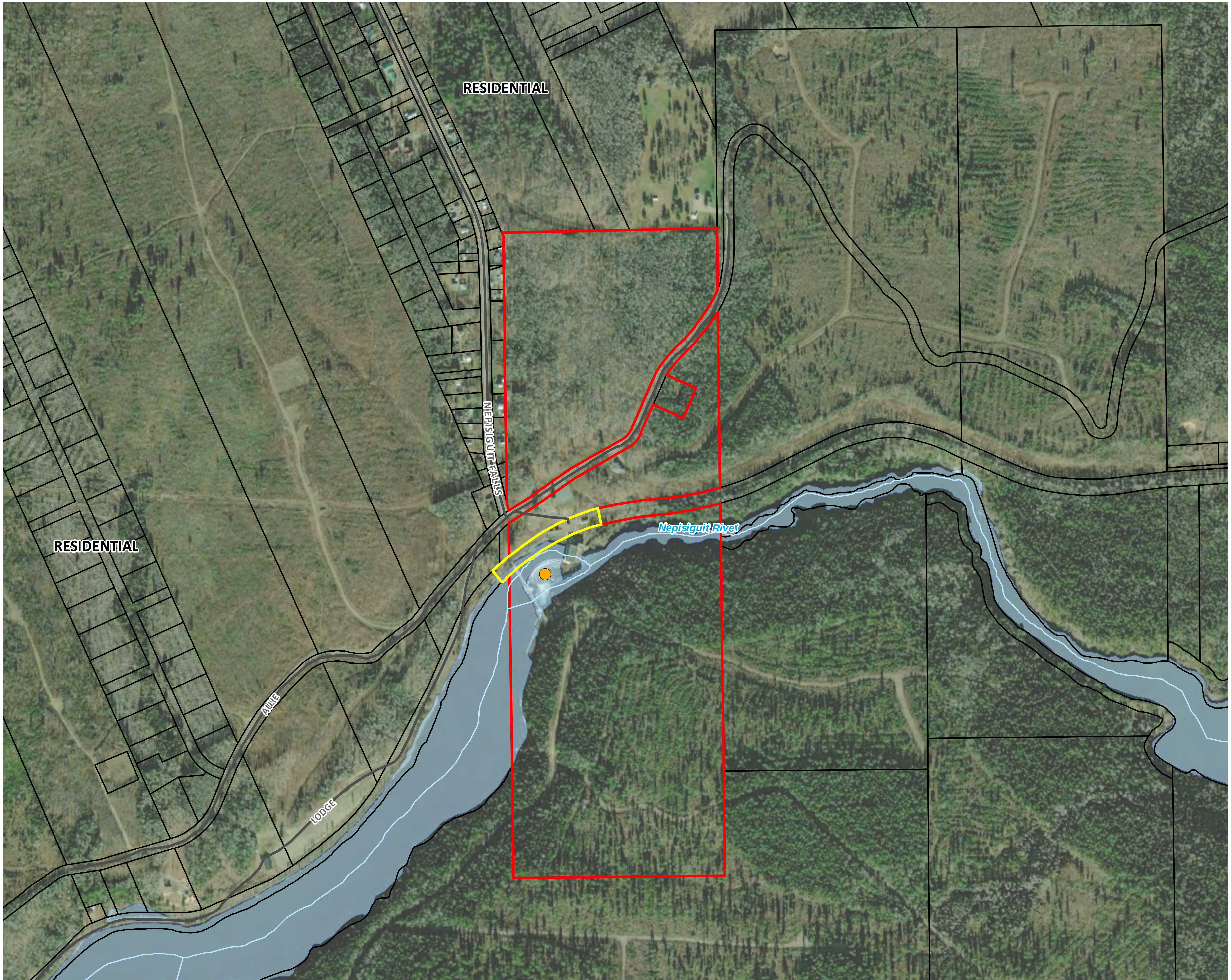
2.1.1 Property Ownership

The subject property that comprises the Station, as shown in **Figure 2.1.1**, is owned by NB Power. PID No. 20872263 is directly associated with the Station and remains in active use by NB Power.

NB Power also retains a Crown Licence of Occupation (LOO) of PID No. 20378927. Within the Nepisiguit River itself, NB Power owns the submerged water lot.

NB Power purchased the Station in 2008 and has continued to maintain and upgrade the operating equipment to current safety and operational standards.

[This page was intentionally left blank]



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

NB POWER PROPERTIES AND ADJOINING PROPERTIES

FIGURE 2.1.1

- Nepisiguit Falls Generating Station
- Road
- Watercourse
- NB Power Property
- Crown Land Licence (Licence of Occupation)
- Adjoining Properties
- Waterbody

0 50 100 200 km

SCALE 1:7,300

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: AS
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641
STATUS: DRAFT
DATE: 2021-08-27

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\Figure2_NBPowerProperties.mxd

The surrounding parcels of land within a 2 km radius of the Station with specific designations are described as lots with residences, camps, cottages, or garages. According to Service New Brunswick, the non-designated parcels within 2 km of the Station are described as lots with no transaction dates associated with them and a general assessed property value of 100 dollars each.

The area encompassed by the aforementioned parcels of land are primarily forested and dominated by spruce and pine trees of varying ages, since a considerable amount of harvesting has taken place on them throughout the years. It also encompasses a section of the Nepisiguit River that runs through the southern section of PID No. 20872266.

2.2 Overview of the Existing Nepisiguit Falls Generating Station

The Station is a hydroelectric generating station located on the Nepisiguit River, approximately 30 km south of Bathurst, New Brunswick.

The Station began operation in 1921 and currently consists of three generating units (also known as turbine-generator units), each with a design rating of 3.6 MW for a total nameplate capacity of 10.8 MW. The generating units are of Francis turbine design. Currently, the maximum power production output is limited to 10.2 MW due to the aging condition of the units.

Along with the three generating units, the Station also consists of the following major components as were shown in **Figure 1.2.2**:

- A forebay, also known as an impoundment area and sometimes referred to as a headpond, is created by the Station's concrete dam structures to retain water upstream of the Station that will later be released through the turbines to generate electricity;
- The main dam, referred to as the sluiceway dam, constructed of concrete that is built atop bedrock that comprises a natural waterfall (Nepisiguit Falls or Great Falls), which together with the rubber bladders retain water in an impoundment;
- A sluiceway and a spillway, located in the middle of the forebay dam, that enable the spilling of water over the dam during periods of excess water;
- A powerhouse building, sometimes referred to as the gatehouse, which is a concrete and brick building that houses the three generating units and associated mechanical and electrical equipment;
- Three penstocks, which are tubes encased in concrete that direct water from the forebay into each generating unit to generate electricity;
- A rubber dam control building that houses the compressors and instrumentation that provide compressed air to inflate the two inflatable rubber bladders used at the site;
- The forebay bladder, a 1.2 m diameter inflatable rubber bladder that spans from the powerhouse to the rubber dam control building, located atop the concrete dam structure to increase the water levels in the impoundment;
- The sluiceway bladder, a 4.6 m diameter inflatable rubber bladder that spans from the rubber dam control building platform to the south shore. The sluiceway bladder prevents water from

spilling through the sluiceway and allows for dewatering of the impoundment when needed for maintenance or flood control purposes;

- A multi-span bridge, consisting of two sections known as the forebay bridge and the sluiceway bridge, that provides access across the Nepisiguit River at the location of the Station. The forebay bridge spans from the north shore of the river to the rubber dam control building platform, and the sluiceway bridge spans from the rubber dam control building platform to the south shore of the river; and
- Associated electrical terminal and transmission facilities on the north shore of the Nepisiguit River.

2.3 Description of Project Components and Activities

As noted previously, engineering design of the Project has not been finalized at this time. The Project description provided in this section presents a high-level "outer envelope" or conservative estimate of the scope, footprint, and anticipated environmental effects of the Project and its related components.

In preparation for the Project, a new bypass road approximately 250 m in length and located between the Sentier NB Trail (i.e., the former rail bed along the north side of the Nepisiguit River) and Nepisiguit Falls Road was recently constructed near the proposed Project to redirect pedestrian and ATV traffic using the trail away from active areas of the Station property. As this new bypass road was required for maintenance and health and safety purposes, and the road itself does not trigger an EIA registration or review as it is not considered to be a "major highway project" or, a "major widening or upgrading of an existing highway" as per item (j) of Schedule A of the EIA Regulation, it is not included in the scope of this EIA Registration.

The Project components, described in "phases" in the subsections below, will be completed by approximately 2030, and although this timeline is assumed to be relatively fixed, there are issues that could arise over this period that could change how and when the different phases might occur.

It is noted that the activities described below represent a simplified version of the complex engineering requirements and construction sequences being developed. The sequence of required activities may vary slightly from that described below as engineering refinements are made and as the EIA review and related permitting processes are conducted.

2.3.1 Construction

2.3.1.1 Phase 1: Turbine-Generator Unit Replacement

The standard design life for the mechanical components in an operational hydroelectric generation facility is approximately 50 years (NB Power 2020). Therefore, all three of the turbine-generator units at the Station are currently well past their design life and have been de-rated from 10.8 MW to 10.2 MW due to their aging condition.

In advance of this work, modifications to the powerhouse itself will be completed in early 2022 to install a garage door on the side of the building to allow for removal via crane of old equipment and installation of new equipment. The generating unit replacement component will initially include the replacement of one of the three turbine-generator units at the Station with a modern DIVE-HAX-Turbine in 2022. Should the replacement of the first unit be successful and meet the operational requirements and specifications for the Station, then the remaining two units may be replaced in 2024 and 2025.

Photo 1: Existing Francis Turbines at the Station

The process for replacement of the turbine-generator units will be identical for all three units (should all three be replaced). Each of the new DIVE-HAX-Turbines will have an approximate nameplate generation capacity of 4.4 MW, for an anticipated total capacity increase at the Station from 10.8 MW to 13.2 MW if all three units are replaced (an increase in production capacity of 2.4 MW, or 22%). The majority of work associated with this component is planned to occur within the powerhouse.

Along with the increased generation capacity as well as extending the service life of the Station, the DIVE-HAX-Turbines offer greater operational flexibility compared to traditional Francis type turbines. DIVE-HAX-Turbines are submersible and have a compact design, which requires minimal infrastructure or space within the powerhouse. The units are also direct drive and free of a transmission or gear box, which according to the manufacturer, reduces noise, vibration and maintenance, and improves efficiency (DIVE-Turbinen 2021). The DIVE-HAX-Turbines have a half-axial runner, which is a different runner design than that of the existing Francis turbines; this and other design features offer the potential to reduce negative interactions with fish compared to other designs, including:

Photo 2: Typical DIVE-HAX-Turbine

- Fewer runner blades than existing Francis turbines;
- Lower runner speed than existing Francis turbines;
- Smoother pressure gradient than existing Francis turbines; and
- No risk of loss of lubrication oil during operation, service inspection, or oil exchange (Perlot, S., pers. comm., 2021).

The turbine-generator replacement work will begin with the installation of a new garage door in the transformer bay, on the downstream side of the powerhouse. This will require the removal of part of an exterior wall and will be the exit point for the old turbine-generators as well as the entry and egress point for the new turbine-generators into/out of the powerhouse.

The work required outside of the powerhouse will include mobilizing wash cars (i.e., portable washrooms), trailers, temporary utilities, and other equipment. It may also require work on the pre-existing exterior concrete platform situated below the new garage door in order to accommodate specialty transport trailers which will be used to move the turbine-generators into and out of the building (i.e., levelling concrete for optimal operation of transport trailers).

Within the powerhouse, turbine-generators will be moved using an existing 40 ton bridge crane that is integrated within the powerhouse. They will be moved into and out of the building using the specialty transport trailer.

There will be a laydown/staging area for the crane or boom truck that will be used to place and remove the old turbine-generator units before loading them onto trucks for transport to recycling/disposal facilities. Some of the balance of plant (BOP) equipment and raw material (i.e., pipe, cable, and steel) may be stored in this area until it is ready to be installed.

The old turbine-generator units and associated equipment that will be removed may contain asbestos and/or lead paint; following testing to confirm whether or not these contaminants are present. These components will be disposed of at approved facilities. The material not containing asbestos and lead will be recycled where possible, or disposed of at approved facilities (e.g., sanitary landfill).

It is possible that rock anchors will be installed within the powerhouse to increase its structural integrity to facilitate the installation of the new turbine-generators. This will include drilling into the concrete powerhouse through to the bedrock, and installing anchors within the bedrock to stabilize the powerhouse structure. This work will occur between the demolition/removal of the old units and installation of new units.

This component also includes possible work on the penstocks that are used to draw water from the forebay into the turbine-generator units. Based on the results of a recent inspection (recommendations pending), this work may include surface preparation of the metal liners of the penstocks, welding, and repair as necessary, and installation of a new protective coating.

Once the first unit is installed, it will be commissioned and placed into service. After the unit has been confirmed to be performing as per its design parameters, NB Power will determine whether or not it will replace the other two units.

During the construction activity associated with this phase, there will be limited interaction with the natural environment since most work associated with the turbine-generator unit replacements are carried out within the powerhouse. Except for the garage door installation, removal of the old units from the powerhouse, entry of the new units into the powerhouse, and related storage and handling within disturbed areas of the Station property, there is no work outdoors for this phase. The penstock associated with each unit being worked on will be isolated using stop logs so as to divert any water from flowing into the unit being worked on, thereby minimizing effects to fish and fish habitat. Although the new turbine-generator units will have an increased power generation capacity as compared to the existing units, changes in water use, water flows, or water elevations in the impoundment are not expected.

The increased power from the new generating units will be generated by increased efficiencies as well as more effective use of available water in the impoundment (i.e., less spilling during periods of high water levels). The turbine-generator units will therefore generate more electricity on an annualized basis compared to currently as a result of the ability to operate under a range of flow conditions, as opposed to currently where units need to be shut off under high flow conditions since they are not able to effectively operate during flood conditions.

It is noted that, as with many of NB Power's other hydroelectric generating stations, the Station will be able to be operated remotely from other hydroelectric generating stations (if so desired) once the new turbine-generator units are operational. There will always be a need to have one operator and one maintenance person once all the units are converted over to the new DIVE-HAX-Turbine technology.

2.3.1.2 Phase 2: Forebay Bridge Replacement or Repair

There are two existing bridge spans that span the Nepisiguit River at the Station. The first bridge, called the forebay bridge, spans from the north shore of the river near the Station's parking lot to the rubber dam control building platform. The second bridge, called the sluiceway bridge, spans from the rubber dam control building platform to the south shore of the Nepisiguit River. Together they form a multi-span bridge that crosses the entirety of the Nepisiguit River.

Photo 3: Existing Forebay Bridge

The main operational purpose of these bridges is to allow the Station's operators access to the bladder control building that is stationed in between the two bridges. NB Power's operators also cross these bridges multiple times a year for maintenance, troubleshooting, as well as installing and removing the safety buoys (booms). Additionally, since NB Power purchased the Station in 2007, it has allowed Rightsholders (i.e., First Nations), the Nepisiguit Salmon Association, the Nepisiguit Mi'gmaq Trail users, and other selected members of the public to use these bridges in order to access the south side of the Nepisiguit River (NB Power 2020). That public and First Nations use of the bridge was curtailed in 2020 due to structural concerns with the forebay bridge centre pier, potentially causing a safety hazard.

The forebay bridge dates back to the construction of the Station in the 1920s and is in need of repair or replacement so that vehicle transport across it can resume. The use of the forebay bridge is currently prohibited and can only be used for pedestrian traffic due to the deteriorating structural condition of its centre pier. The forebay bridge superstructure appears to remain functional and in relatively good condition for its age, but the centre pier supporting the superstructure is in an advanced stage of deterioration.

The sluiceway bridge was refurbished in 2012 and its condition remains suitable and will not be affected by this phase of the Project.

Two options are currently being considered for the forebay bridge: 1) replace the forebay bridge with a single-span Bailey bridge; or 2) repair the current forebay bridge. Another option that has been presented is to replace the forebay bridge with a walking bridge, but this is an unlikely option. NB Power is currently evaluating the feasibility of these options and will decide which option to pursue in light of that feasibility assessment. For the purpose of this EIA Registration, both options will be assessed together. Further information is as follows.

<u>Option 1 – Replace with a Single-Span Bailey Bridge</u>

Replacing the current forebay bridge with a single-span Bailey bridge is currently considered to be the preferred option in terms of environmental impact as well as NB Power's operational preference.

A single-span Bailey bridge would render the underlying bridge piers unnecessary as it only requires anchor points on each end of it. The piers would be abandoned in place, reducing the interaction with the natural environment. The work required to complete Option 1 generally includes the following:

- Mobilization of trailers, wash cars (i.e., portable washrooms), and temporary utilities;
- Equipment, trucks, and other mobile equipment that may come into contact with the ground surface or the river will be washed, to prevent the spread of invasive species;
- Preparation of temporary power and controls for the bladders, with the option to make it permanent. The cables for power and controls currently run on the current bridge;
- Modifying the pre-existing fencing in the area to accommodate the installation;
- Removal of lighting on the existing bridge as well as possibly moving distribution line;
- Construction of crane pad for the crane position;
- Removal of the existing bridge superstructure, and disposal of it at approved facilities;
- Ground work around the north pier along the shoreline to enable the placement of the Bailey bridge, including digging, concrete work, and backfilling to prepare the abutment;
- Stabilizing the north side of the centre platform associated with the bladder control building, to prepare for the new bridge;

- Installing single-span Bailey bridge using a crane or boom truck, and attaching it to the abutments;
- Installing lighting and fencing; and
- Demobilization of crane and other equipment from the site.

Option 2 – Repair Current Forebay Bridge

Repairing the current forebay bridge includes major repairs to the foundation (centre pier) and minor repairs to the superstructure (structural steel). Repairs to the centre pier are extensive and would require major concrete in-water work due to its deteriorated state. Repairs to the superstructure include but not limited to sandblasting, painting, and replacement of some pressure-treated wood decking. The work required to repair the current forebay bridge (should that option be selected) is outlined below.

General:

- Mobilization of trailers, wash cars, and temporary utilities;
- Equipment, trucks, and other mobile equipment that may come into contact with the ground surface or the river will be washed, to prevent the spread of invasive species;
- Possible preparation of temporary power and controls for the bladders (if required), with the option to make them permanent; and
- Modifying the pre-existing fencing in the area to accommodate the installation and repair.

Pier Work:

- The ensuing work will be completed by divers and workers in boats or on scaffolding. No cofferdam required during this phase;
- Installation of a diving platform and or cage;
- Laydown area and assembly platform;
- Remove the damaged concrete on the pier down to solid material in situ by chipping it away using manual methods, and collection and disposal of chipped concrete at appropriate facilities;
- Installation of anchors and rebar used for new concrete (a cofferdam is not likely needed for this work);
- Build new concrete forms in and out of water around the bridge pier and the new abutment;
- Pour concrete within the annulus of the forms and allow concrete to set. Poured concrete will displace water within the annulus of the forms for the pier. The forms can be left in place or removed after concrete has set; and
- Demobilize divers.

Superstructure:

- Test the paint on the superstructure to determine if it contains lead paint, and identify suitable disposal facilities accordingly;
- Jack up the bridge superstructure, and perform anchor and grout replacements on both the north and south ends;
- Repair stiffeners;
- Repair the north end abutment using concrete repair techniques. All work will be completed from land;
- Construct scaffolding around the bridge and tarp it in;
- Complete blasting of the surfaces, collect and dispose of spent blast material at appropriate facilities;
- Apply a protective coating;
- Remove scaffolding and tarps; and
- Replace any degraded decking.

As part of Option 2, there will be either a crane or boats required for transportation of personnel, materials, and equipment as well as the requirement for temporary scaffolding throughout the pier work and superstructure work.

2.3.1.3 Phase 3: Sluiceway Bladder and Forebay Bladder Replacements

There are two inflatable rubber bladders at the Station: the forebay bladder, and the sluiceway bladder. These bladders are the only ones of their kind operated at NB Power's hydroelectric facilities. Both bladders have a manufacturer's life expectancy of 20 years (NB Power 2020).

The forebay bladder sits atop the forebay portion of the concrete dam structure; its purpose is to allow the water elevations in the impoundment to be raised beyond the elevations that would be achieved with the concrete dam structure alone. The forebay bladder consists of a 1.2 m diameter bladder that spans from the powerhouse to the rubber dam control building platform, atop the forebay portion of the concrete dam structure. The bladder is inflated by compressed air provided by compressors housed in the rubber dam control building. The forebay bladder was purchased by the previous owner in 2008 and stored until 2012 when it was installed.

Photo 4: Forebay Bladder Sitting Atop the Concrete Dam

The sluiceway bladder is a 4.6 m diameter bladder that spans from the rubber dam control building platform to the south shore of the river, within the sluiceway. The operational purpose of the sluiceway bladder is to maintain water elevations in the impoundment thereby forcing water to flow through the turbines rather than spilling through the sluiceway. It is also used for the controlled dewatering of the impoundment via the sluiceway (along with the adjacent spillway) in the event of required maintenance or flood conditions leading to elevated water levels. Like the forebay bladder, it is also inflated by compressed air provided by compressors housed in the rubber dam control building, and replaces the need for stop logs or mechanical gates that normally would be used within spillways at hydroelectric facilities. The sluiceway bladder was installed in 1999.

Based on an engineering inspection completed in 2020, the sluiceway bladder was deemed to be beyond its recommended service life and requires replacement by 2024, with anticipated replacement in 2023. The forebay bladder is currently in good condition and will not require immediate replacement. The inspectors recommended that another engineered inspection with destructive testing be completed 20 years from the manufacture date (i.e., in 2028). The 2028 inspection will provide a timeframe of replacement. Currently, a forebay bladder replacement is not expected before approximately 2030.

The replacement of both bladders will require the installation of cofferdams. The exact type and design of the cofferdams has not yet been finalized. The general process is virtually the same for both types. The water elevation in the impoundment will be temporarily lowered by completely deflating the sluiceway bladder, opening the spillway, and/or allowing water through the turbines and allowing the impoundment to naturally dewater in a controlled manner over a period of 24 to 48 hours via the spillway, sluiceway, and/or the generating units. The respective cofferdam for each bladder (sluiceway bladder in 2023, forebay bladder in 2030 or later) will then be constructed within the impoundment, above this elevation, to isolate either the forebay bladder or the sluiceway bladder, as the case may be. The cofferdams will be constructed using rockfill and gravel trucked to the site from approved borrow sources. Once the cofferdams are built, a fish rescue operation would be carried out within the impounded areas within/behind the cofferdams so as to prevent undue harm or mortality to fish that might be trapped in the area. The impounded area within the cofferdam will then be dewatered by pumping out the water from within it. Because this is the same water inside the cofferdam as outside, no measures will be required to treat or dispose of the water in any way. Once the work area is dry, the impoundment levels will again be allowed to rise to normal levels while the bladder replacements are taking place.

Photo 5: Sluiceway Bladder Sitting atop the Sluiceway, with the Spillway to the Right of the Photo underneath the Rubber Dam Control Building

The cofferdams have not yet been engineered at this time. Preliminary estimates indicate that the cofferdam for the sluiceway bladder replacement in 2023 will be constructed of rockfill and gravel in a “U-shape” within the impoundment to isolate the sluiceway bladder. Based on preliminary design estimates available at the time of writing, the cofferdam for the sluiceway bladder replacement will have an approximate footprint of 3,600 m^2 of fish habitat on a temporary basis.

Similarly, preliminary estimates indicate that the cofferdam for the forebay bladder replacement in 2030 will be constructed of rockfill and gravel in an approximate straight line between the north shore of the impoundment to the rubber dam control building. Based on preliminary design estimates available at the time of writing, the cofferdam for the forebay bladder replacement will have an approximate footprint of 1,100 m^2 of fish habitat on a temporary basis.

Upon completion of the planned bladder replacement work, the water levels in the impoundment will again be temporarily lowered to enable the removal of the cofferdams, and the cofferdams will be removed. Erosion and sedimentation control measures such as hay bales, check dams, and other similar devices will also be used as necessary during construction and removal of the cofferdams. Once the cofferdam removal is complete, water levels in the impoundment will again be allowed to rise to normal levels.

The sluiceway bladder replacement in 2023 will require mobilization including wash cars, trailers, temporary utilities and equipment, as well as preparation and set up of those temporary utilities. The elevation of the water will then be lowered to the level of the impoundment before the cofferdam is constructed and fished out and dewatered as mentioned above. The sluiceway bridge superstructure may have to be removed before accessing the sluiceway bladder. This may be done by jacking the structures up, or if removed, this will likely require the use of a crane. The existing sluiceway bladder will then be removed, and the underlying concrete structure can then be inspected. Any repairs performed will be done before installing the new rubber bladder. After the bladder has been successfully installed, an air pressure test will be performed to ensure its integrity. Once that is complete, the sluiceway bridge will be reinstalled and the cofferdam can be removed. The impoundment will be allowed to flood to normal water elevations. The old bladder and any other materials generated during this replacement will be stored on-site until disposed of at an approved facility for disposal at the appropriate time.

The forebay bladder replacement in 2030 or later will follow the same initial steps as the sluiceway bladder replacement, with the mobilization of equipment and set up of temporary utilities. The water elevation of the impoundment will be lowered and the cofferdam will be constructed, fished out, then the impounded area within the cofferdam will be dewatered. This replacement, based on its location, will require the construction of temporary roads and platforms to be built within the dry area inside the cofferdam. The existing forebay bladder will then be removed, and an inspection of the underlying concrete structure will occur and necessary repairs performed. The new rubber bladder will then be installed and tested for integrity.

Prior to removal of the cofferdam, the work will also include essential structural repairs to the concrete wall of the forebay adjacent to the parking lot as it will be accessible from within the cofferdam. This will involve the removal of loose damaged concrete and the repair including forming, pouring of concrete, and setting. New concrete plate protectors and an ice shield will be installed at the same time to take advantage of the presence of the cofferdam at that time.

Once all this work is complete, the cofferdam will be removed and the site will be demobilized of all equipment, and the impoundment will be allowed to flood to normal water elevations. As with the replaced sluiceway bladder, the old forebay bladder will be kept on-site until transport to an approved facility for disposal at the appropriate time.

2.3.1.4 Phase 4: Structural Repairs to the Powerhouse, Forebay, and Tailrace Concrete Structures

The 100-year old powerhouse structure has achieved its standard design life considered for structural components of a hydroelectric facility. The concrete structure has experienced normal erosion and deterioration due to operations, expansion and contraction, as well as exposure to the elements. Based on an inspection conducted in 2020, structural repairs are required to be completed in order to extend the life of the powerhouse, with the most noticeable repairs required in the tailrace and forebay areas, near the water line. NB Power is planning on using a combination of wet work (which will be carried out underwater by divers) and dry work (which will be carried out from shore and with the use of a boat). There are no plans at this time to use cofferdams to complete these repairs.

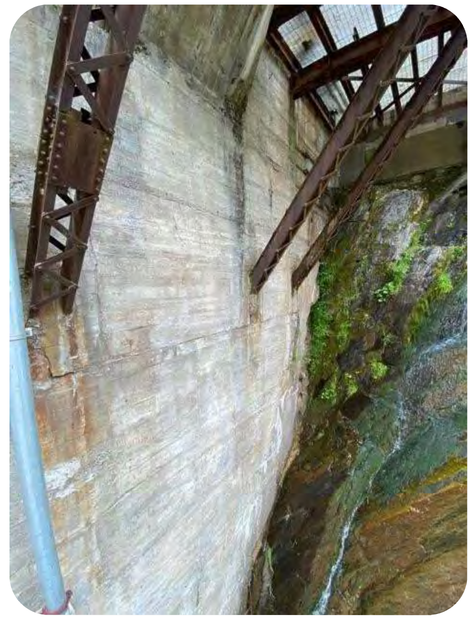


Photo 6: Example of Repairs Required in Tailrace Area

The structural inspection of the tailrace area indicated that repairs should be completed in the next five years (by approximately 2025) to reduce further structural damage. The tailrace repairs will require extensive planning due to safety issues with access and egress to the tailrace waters as well as the issue of accessing the above-ground erosion that is occurring next to the rock base (NB Power 2020).

Based on the structural inspection results, the forebay structural repairs can be completed in approximately 2030 alongside the forebay bladder replacement and structural repairs to the bladder walls. Conducting the forebay structural repairs in parallel to the forebay bladder replacement work takes advantage of the presence of a cofferdam during that work, for efficiency.

Photo 7: Photograph Showing the Deteriorating Condition of the Concrete Walls in the Forebay Area

The work will require mobilizing of wash cars, trailers, temporary utilities and other equipment as well as preparation and set up of the temporary utilities. The wet work may require the installation of diving platform, whereas the dry work may require the installation of a work platform or possibly scaffolding.

Structural repairs of the powerhouse will be conducted in dry conditions, whereas the structural repairs to the forebay and tailrace concrete structures may be carried out using a combination of wet and dry working techniques. The following will be applicable to both the wet and dry work associated with forebay and tailrace concrete repairs. There will need to be laydown areas and/or assembly platforms constructed prior to any work commencing. The degraded concrete in the forebay and tailrace areas will then be removed by manual methods (i.e., chipping) along with any previously done plate repairs or erosion repairs. After concrete removal is complete, the damaged concrete will be collected and disposed of at appropriate facilities. The structural repairs will be completed through the use of anchors, rebar and other materials before construction of the concrete forms. The concrete can then be poured within the forms, displacing any water contained between the concrete face and the forms, and left to set. The forms can then be removed or left in place. Once this is complete, the crews, divers and workers from shore or boat will demobilize from the site.

2.3.2 Operation

The operation of the Station is expected to continue throughout construction of the Project phases outlined above to the extent possible. It will not be possible to operate all units during the turbine-generator unit replacement phase since the unit being replaced will not be operational, although other units may continue being operated while a particular unit is being replaced. In addition, power generation may be suspended during short periods of time when it is necessary to interrupt operations for logistical or safety reasons (e.g., during dewatering of the impoundment or when water will be spilled rather than used to generate electricity).

Upon completion of each of the phases listed above that comprise the Project, normal operation of the Station will continue in much the same manner as it has been in operation for over 100 years (except that part of its operation may be remote), with the main activity consisting of power generation, along with the completion of periodic routine maintenance. Although the new turbine-generator units will have a greater nameplate production capacity than currently (4.4 MW each vs. 3.6 MW, a 22% increase in capacity) and will generate more electricity on an annual basis (in terms of MWh produced) compared to currently, it is anticipated that the operation of the refurbished station will be similar to today's operation since the amount of water available in the Nepisiguit River at any given time is limited. Water levels in the forebay will be managed in a similar way to current conditions with the operation of the existing Station.

Similar to current operation of the Station, maintenance activities could require the periodic shutdown of the one or more of the generating units. Maintenance activities will be completed in isolation of the watercourse and in accordance with applicable regulatory requirements.

It may be possible to continue to operate the refurbished facilities, albeit at a reduced capacity while some maintenance is occurring (e.g., operating only some turbine-generators); however, there could be times when a full shutdown is required for maintenance or inspections. Maintenance activities may require periodic drawdowns of the impoundment.

NB Power has implemented various safety procedures for the safe operation of the existing Station and spillway in consideration of the public. These safety procedures will be maintained during the ongoing operation of the Station.

2.3.3 Decommissioning

Decommissioning refers to the removal of the dam and its associated structures at the end of the Station's service life. The Project is anticipated to extend the life of the Station by approximately 50 years (i.e., until approximately 2075), enabling it to continue to generate electricity for New Brunswickers during that time. Once the Station has reached its useful service life, it may be decommissioned, or it may be operated for an indefinite time with ongoing repair and refurbishment. If decommissioning activities are determined to be necessary, they will be completed in accordance with the applicable regulations that are in force at that time, including any required environmental assessments and regulatory approvals that might be required to enable decommissioning to take place.

When decommissioning takes place, it is anticipated that this would involve a combination of both the removal of buildings, equipment, and structures, and the infilling of subsurface structures, such as powerhouse foundations and excavations. Following decommissioning, the site would need to be stabilized and reclaimed for the desired purpose determined at the time. Retirement or decommissioning of the Station at the end of its service life may alter the hydraulic regime of the channel due to the absence of flow regulation, but often the dam or associated structures are retained without alteration.

Planning and engineering design for decommissioning will be completed towards the end of the Project's life, in accordance with the requirements in place at that time.

2.4 Project Schedule

NB Power plans to undertake the Project in distinct components that will span multiple years between 2022 and 2030. The anticipated Project schedule (subject to change) is provided in **Table 2.4.1**.

Table 2.4.1: Anticipated Project Schedule

Year	Planned Activity
2022	Installation of garage door in transformer bay, generating unit 1 replacement, and forebay bridge replacement/repair.
2023	Sluiceway bladder replacement.
2024	Generating units 2 and 3 replacement (if applicable).
2025	Remaining generating unit 2 and 3 replacement activities (if applicable), tailrace structural repairs.
2030	Forebay structural repairs, forebay bladder replacement.

The Project schedule has not been finalized and may vary from that outlined above. The work will be scheduled for each year to avoid during sensitive periods (e.g., avoiding clearing and earth moving activities during migratory bird breeding/nesting season), where possible.

2.5 Workforce

The workforce required for constructing and operating the Project is relatively modest, given the somewhat simple nature of the Project and its intended operations.

During construction of the individual Project phases discussed above, activities will be carried out largely by third party engineering and construction contractor(s) selected by NB Power through its normal tendering and procurement processes. The contractor(s) will work under the supervision of NB Power. It is expected that the contractor(s) selected for each of the individual Project phases would be able to carry out these construction activities largely with their existing staff, although additional staffing is possible. Contractors will be encouraged to use established companies in the local region to complete this work (assuming commercial agreements can be reached). Some specialty work such as diving, concrete work, bridge, and bladder replacements may require specialized expertise that may not be available in the local region. An estimated staff complement of 10 to 20 workers at any given time are expected to be required to accomplish the Project phases, although requirements may vary.

The current workforce to operate the Station is approximately seven NB Power employees. Since operation of the refurbished Station will largely be carried out remotely from other hydroelectric stations once the new turbine-generator units are in place, a modest workforce will be required on-site during operation of the refurbished Station. Other staff may be dispatched on occasion to meet specific demands. Any personnel at the Station that are no longer needed following life extension will simply be reassigned to other NB Power operations, so that no jobs are lost as a result of the life extension.

2.6 Emissions and Wastes

The anticipated emissions and wastes associated with the Project are discussed briefly in this section. NB Power, through the conditions of the various permits and approvals it will receive for the Project, will meet or exceed the compliance standards outlined in applicable regulations and guidelines with respect to waste, emissions, and discharges from the Project.

Where no such standards exist, industry best practices will be adopted, where applicable. Emissions and wastes will be reduced through best management practices, following applicable legislation, and mitigation planning including the development of a Project-specific Environmental Management Plan (PSEMP) and related mitigation and management measures developed for each applicable phase. The PSEMP may consist of one umbrella document governing activities to be conducted for all phases, or may be broken down by Project phase to describe specific mitigation and management measures that are focused on activities conducted for a particular phase.

2.6.1 Air Contaminant Emissions

Air contaminant emissions from the Project will occur primarily from dust generated from decommissioning, demolition, removal, and restoration activities as well as from fossil fuel combustion in trucks and mobile equipment used to accomplish those activities. Emissions of concern are generally classified as criteria air contaminants (CACs) and include carbon monoxide (CO), nitrogen oxides (NO_X), sulphur dioxide (SO_2), and total particulate matter (PM, including its size fractions PM_{10} and $PM_{2.5}$). Given the relatively straightforward nature of the Project, measurable emissions of other air contaminants (other than greenhouse gases, discussed below) are not expected.

Emissions are generally related to the generation of dust and routine emissions from construction equipment or other construction activities. Equipment used for construction will generally consist of trucks, excavators, rock breakers, cranes, boom trucks, bulldozers, backhoes, and other heavy equipment, similar to what may be seen on many industrial construction sites. Control measures such as use of dust suppression techniques will be used, as required, to reduce the fugitive dust, and routine inspection and maintenance of construction equipment will reduce exhaust fumes. Timing of activities to avoid undue nuisance to off-site receptors (e.g., limiting intrusive activities to between 7:00 a.m. and 7:00 p.m. [i.e., average daylight hours] on Monday to Saturday, excluding statutory holidays) will be important. The burning of waste brush/slash material will not be permitted.

Greenhouse gas (GHG) emissions from the Project, consisting of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), as carbon dioxide equivalents (CO_2e), will be generated from fossil fuel combustion in trucks and mobile equipment used to accomplish the Project activities. Given the relatively straightforward nature of the Project, these emissions are not expected to be substantive.

An assessment of the interactions between the Project and the atmospheric environment due to Project-related air contaminant and GHG emissions is provided in **Section 5.2**.

2.6.2 Noise and Vibration

Noise emissions from the Project will occur primarily from the operation of mobile equipment for use in facility upgrade activities. Vibration will also occur from these same sources, although to a lesser extent.

Noise and vibration will be intermittent, as equipment is operated on an as-needed basis while Project activities are taking place, and mostly during daytime hours.

Noise sources will be mitigated through the use of mufflers on all equipment, carrying out routine maintenance of equipment to maintain it in good working order, and limiting intrusive noise-producing operations to daytime (7:00 a.m. and 7:00 p.m.), Monday to Saturday, excluding statutory holidays.

An assessment of the interactions between the Project and the acoustic environment is provided in **Section 5.3**.

2.6.3 Liquid Wastes

Liquid wastes generated during facility upgrade activities include oils and lubricants from the mobile equipment. These wastes are considered dangerous goods and will be collected and disposed of in accordance with applicable local and provincial regulations. Other liquid wastes, including sewage and domestic wastewater, will either be from the use of wash cars or portable toilets (trucked away by approved contractors) or be treated in the Station's existing sewage treatment facilities (consisting of septic tank and leaching field).

Some old equipment removed as part of the life extension activities may contain residual fluids. That equipment will be drained of as much fluid as possible, and the removed liquids will be disposed of at approved facilities. Any equipment that may have contained fluids in them will be stored in leak-free containment bins or other suitable containment measures pending their transport to disposal facilities.

2.6.4 Solid Wastes

Solid wastes generated during facility upgrade activities will include concrete, brick, rock, metal, wood, creosote-treated wood, and other detritus. The means by which each of these types of wastes would be recycled, reused, or disposed of were outlined in the description of Project phases and activities in **Section 2.3** above. Special care will be taken with the old turbine-generator units or other equipment which may contain asbestos and/or lead paint. Other large pieces such as the old bridge and bladders will be kept whole as much as possible and sent to an approved disposal facilities.

Dangerous goods and hazardous materials will be stored on-site in a separate temporary dangerous goods storage area provided with full containment. Dangerous goods will be removed from the site by a licensed contractor and recycled or disposed at approved facilities.

Any equipment that may have contained fluids in them will be stored in leak-free containment bins or other suitable containment measures pending their transport to disposal facilities.

[This page was intentionally left blank]

3.0 Overview of Environmental Setting

A high-level overview of the environmental setting for the Project is provided in this section.

3.1 Physical Setting

3.1.1 Physiography and Geography

The Station is located at Nepisiguit Falls on the Nepisiguit River, in the rural area of Bathurst Mines, approximately 30 km south of Bathurst, Gloucester County, in northern New Brunswick.

3.1.2 Topography and Drainage

To a large degree, the landscape of the Station area reflects the shape of the underlying bedrock (Zelazny 2007). The elevation of the Station at the top of the Nepisiguit Falls is approximately 107.5 m amsl and the elevation at the base of the falls is approximately 80 m amsl.

The Nepisiguit River watershed consists of predominantly undeveloped wooded terrain and is subject to spring flood events due to snow melt and, to a lesser extent, intense rainfall. The Nepisiguit River at the location of the Station flows northeast towards Bathurst before discharging to the Chaleur Bay.

3.1.3 Surficial Geology

The surficial geology of the Nepisiguit Falls area consists of late Wisconsinan blanket morainal sediments. The sediments consist of loamy lodgment till, minor ablation till, silt, sand, gravel, rubble that was deposited directly by Late Wisconsinan ice or with minor reworking by water (Burrell and Anderson 1991).

3.1.4 Bedrock Geology

The bedrock in the area consists of the Nepisiguit Falls Formation which is a transitional area between the higher elevations of the Tetagouche ecodistrict to the southwest and the Nicolas-Denys ecodistrict to the northeast (GNB 2008; NBDNR 2008). The Nepisiguit Falls Formation consists of a dacitic to rhyolitic, quartz-feldspar porphyritic felsic volcanic rock with mixed pyroclastic and effusive characteristics (Langton and McCutcheon 1993).

3.2 Biophysical Setting

3.2.1 Climate

New Brunswick has a humid continental climate, with slightly milder winters on the Gulf of St. Lawrence coastline.

Northern New Brunswick experiences a subarctic climate, particularly in the more elevated area in the far north. Southern New Brunswick experiences a more moderate maritime climate than the northern or central parts of the province as the Bay of Fundy never fully freezes, thus moderating the winter temperatures and providing generally cooler summer temperatures compared to other inland locations.

The nearest representative weather station to the Station is located at Nepisiguit Falls. Climate normals data at the Nepisiguit Falls station are limited to temperature and precipitation. On average, temperatures are lowest in the winter and early spring, and highest during the summer months. Daily averages range from a low of -12 °C in January to a high of 18.6°C in July. Precipitation, on average, is highest during the summer. From 1981 to 2010, the region has received an average of 1,017.3 mm of precipitation per year, of which 750.4 mm was rain and 266.9 mm was snowfall (as water equivalent) (GOC 2021a).

The nearest available wind data is from the Bathurst (A) Airport weather station, located approximately 25 km northwest of the Project site. Monthly maximum hourly wind speeds measured at the Bathurst A station range from 41 to 65 km/h. The dominant wind directions range from south to west, with the exception of maximum hourly winds blowing from the northeast in January and September (GOC 2021b).

3.2.2 Atmospheric Environment

The Project is located in a largely rural area within the community of Bathurst Mines, in Gloucester County, with no substantive industrial sources (which tend to release air contaminants) currently located nearby. Thus, sources of air contaminants in the immediate vicinity of the Project are mainly limited to vehicle and home heating emissions. Despite this, the ambient air quality in the area is generally considered to be good to very good based on data collected at the Bathurst monitoring station (approximately 30 km north of the Station), which is the closest representative station to the Project site. The low population density and rural character of the area, and the lack of substantive emission sources in the area, likely contribute to favourable ambient air quality.

3.2.3 Freshwater Environment

The Nepisiguit River is located in the northeastern portion of New Brunswick, flowing into Chaleur Bay at the city of Bathurst. The Nepisiguit River boasts numerous lakes and tributaries which provide access for tourism and recreation and have been historically important for the now less dominant forestry, fisheries, and agricultural industries in the area.

The Nepisiguit Falls themselves are impassable to diadromous fish (i.e., fish that migrate between freshwater and marine environments) because of their 30 m drop in elevation, and therefore fish assemblages are vastly different when comparing reaches above (upstream) and below (downstream) of the Station. A number of both native and non-native freshwater and diadromous (i.e., anadromous and catadromous) fish species are known to be found in the Nepisiguit River. The most common native freshwater species generally include brook trout (*Salvelinus fontinalis*), American eel (*Anguilla rostrata*), striped bass (*Morone saxatilis*), alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), and Atlantic salmon (*Salmo salar*) (Baker, R., pers. comm., 2021).

The Nepisiguit Falls are a natural barrier to fish passage, thus the fish species assemblage below the falls (which includes Atlantic salmon and other diadromous fish) is more diverse than above the falls.

3.2.4 Terrestrial Environment

The Project site is located within the Northern Uplands ecoregion and, more specifically, within the Tjigog ecodistrict, which sits on an undulating plateau that extends from the North Charlo River down to the Nepisiguit River. Northeasterly flowing watercourses along bedrock faulting characterize this area (Zelazny 2007). The ecodistrict is a transitional area between the higher elevations of the Tetagouche Ecodistrict to the southwest and the Nicolas-Denys ecodistrict to the northeast, with elevations ranging from 300 m to 100 m amsl. Compact, medium-textured soils, originally from metasedimentary and igneous rocks, dominate the southern reach along the Nepisiguit River (Zelazny 2007).

Within this ecoregion, tolerant hardwood stands dominated by American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*) on well-buffered soils and along lower elevations. On the more inland and higher elevations, coniferous trees become more prevalent, especially balsam fir (*Abies balsamea*), black spruce (*Picea marianan*), white spruce (*Picea glauca*), red pine (*Pinus resinosa*), and white pine (*Pinus strobus*). In the river valleys of this region, trembling aspens (*Populus tremuloides*) are particularly common (Zelazny 2007).

3.3 Socioeconomic Setting

The following section provides a summary of the socioeconomic setting near the Project site. It should be noted that limited area specific data was available due to the site's rural character. Demographic and economic data are typically scoped to a larger area, in this case Bathurst Parish. Where possible, information pertaining to the immediate area is presented but generalizations were needed to complete the description of the socioeconomic setting.

3.3.1 Demographic Overview

The Project site is within the Bathurst Parish Census Subdivision in the 2016 Census, the most recent Census for which data are publicly available. The population of this Census Subdivision in 2016 was 4,797, which is nearly a 4% decrease from 2011 population numbers (Statistics Canada 2017). The population of the area is above the provincial median age of 45.7, with a median age of 50.1. These data are in line with the province of New Brunswick's trends of urbanizing and aging populations.

3.3.2 Economic Activity

The Project is located within the Province's Northeast Economic Region which includes Restigouche, Gloucester, and Northumberland Counties. The Northeast Economic Region employment profile is dominated by the health care and retail and wholesale trade sectors accounting for just over 35% of total employment in the Region. Within Bathurst Parish, the labour force as of the 2016 census was 2,040, representing a participation rate of 57%, slightly lower than the provincial average.

The unemployment rate in Bathurst Parish is at 15%, which is consistent with the unemployment rate across the region as a whole. When considering labour force participation by industry, retail trade, construction, health care and accommodation and food services are the most represented industries in the region.

The Project is located within an area generally known as the Bathurst Mining Camp, an area approximately 70 km in diameter in northern New Brunswick that contains significant mineral deposits and has seen significant mining operations over the years. Brunswick Mines, one of the largest mines in the region, operated until 2013. It had two main operations, Brunswick Mine #6, located less than 2 km from the Project site, and Brunswick Mine #12, located approximately 10 km from the Project site. Both operations were significant employers in the region. Although the mines have closed, mineral exploration within the Bathurst Mining Camp continues and the area remains a considerable target for mineral exploration and extraction into the future.

There was no evidence of economic activity in the immediate vicinity of the Project site. Employment in the area is concentrated in the city of Bathurst, approximately 30 km northeast of the Project site.

3.3.3 Land Use

The area is characterized by largely undisturbed wooded areas. Development is concentrated along Nepisiguit Falls Road and is generally limited to the section of road immediately north of the Project site. The area is made up of large, privately owned lots and provincial Crown land. Crown land in the area is leased for use as camp lots and forestry related uses. The area is also used for recreational hunting and fishing and for recreational vehicle use in all seasons. The primary built form in Bathurst Parish is residential dwellings, comprised of single detached homes. There are 2,055 private dwellings in the Parish, of which 95% or 1,950 are single detached homes.

The small rural community of Bathurst Mines is located to the north of the Project site, running along the Nepisiguit Falls Road. This community is primarily made up of residential land uses with some seasonal dwellings or camp lots interspersed along the same corridor. The nearest structure to the site is a single detached residential dwelling located approximately 150 m north of the Station.

3.3.4 Infrastructure and Services

The community of Bathurst Mines is within the Bathurst Parish Local Service District. The Bathurst Parish Local Service District receives services from the Chaleur Regional Service Commission. These services include solid waste and recycling collection, emergency and policing services, recreational services, and some infrastructure services.

The residential and seasonal residential (camp lot) land uses are serviced by private, on-site wells and septic systems. Storm water is managed by road-side ditching systems.

The transportation network in the immediate area is operated and maintained by the New Brunswick Department of Transportation and Infrastructure (NBDTI). The Station can be accessed by three main roads: Nepisiguit Falls Road, Route 430, or Route 360. All three routes are two-lane rural roads. Nepisiguit Falls Road is a local road approximately 5 km long, and connects Route 430 in the north to the Station through the rural residential community of Bathurst Mines. Route 430 is a local highway and resource road though a mostly undeveloped area of northeastern New Brunswick; it is approximately 111 km in length and connects Bathurst in the north to Miramichi to the south. Route 360 is a connector highway through an undeveloped area; it is approximately 20 km long and connects to Route 430 to the north and Routes 8 and 160 at Allardville, to the west of the Station.

3.3.5 Built Heritage

The Station was commissioned in 1921 to provide power to the Bathurst Power and Paper Company (Glendenning and Dale 2019). Despite the Station's powerhouse being more than 100 years old, it does not currently have legal protection as a local, provincial, or national historic place.

There are no other known built heritage resources in the rural community of Bathurst Mines.

3.3.6 Archaeological and Palaeontological Resources

The Project site is anticipated to have high potential for archaeological resources because much of the site falls within 80 m of a water body (i.e., in this case, the Nepisiguit River). Nepisiguit Falls would have been an attractive site for Indigenous peoples due to its access to water, abundance of fish, and the history of human use by Indigenous peoples generally can be traced back thousands of years (SNMT 2021). The surrounding areas was also an attractive site for early European explorers and settlers. This occupation of the land and resources of this area and in other parts of the traditional territory since time immemorial would be expected to result in a generally elevated potential to harbour Pre-Contact archaeological resources.

The first known non-Indigenous visitors to the area were French settlers in *circa* 1619, followed by Acadian refugees following the deportation of Acadians in *circa* 1755 and later by British settlers in *circa* 1768 (Glendenning and Dale 2019). This later settlement by European descendants would increase the potential for the presence of Historic (Post-Contact) archaeological resources.

The Project site is anticipated to have a low potential for palaeontological resources due to the recent geological history and the lack of sedimentary rock in the area.

3.3.7 Traditional Land and Resource Use

Historically, the lands of northern New Brunswick have been used by Indigenous communities and people for traditional land and resource uses such as hunting, fishing, gathering (i.e., for food or medicinal uses), trapping, subsistence, and related purposes (Goddard 1996). The Nepisiguit River and surrounding lands were first occupied by the Mi'kmaq people (White 1871). The Nepisiguit River, as many others within the province of New Brunswick, was used as a primary mode of transportation and means of sustenance since time immemorial by the Mi'kmaq peoples. The nearby Pabineau First Nation, approximately 25 km downstream (north) of the Station, is particularly involved in practicing traditional activities such as hunting, trapping, fishing, and gathering in this part of its traditional territory.

The historic Nepisiguit Mi’gmaq Trail, a traditionally important trail network that is still in use today, follows the Nepisiguit River for approximately 150 km from Daly Point Nature Reserve at the Bathurst Harbour (i.e., outlet of the Nepisiguit River) to the Bathurst Lakes camps in Mount Carleton Provincial Park.

The trail is thousands of years old and was used to access tribal hunting, fishing, trapping, and gathering sites, including those accessed during seasonal migrations following the availability/seasonality of resources. The trail was also used as a thoroughfare, which the Mi’kmaq peoples traveled to trade with other First Nation communities (NMTP 2020). Based on this longstanding use and present day cultural importance, the trail and lands along the Nepisiguit River are considered to be rich in cultural heritage and have a high probability of undiscovered archaeological artifacts and/or sites (NMTP 2020).

The general area of the Station continues to be used by Indigenous people for practicing traditional activities such as hunting, trapping, fishing, ceremonial, and gathering.

4.0 Environmental Assessment Scope and Methods

Environmental impact assessment (EIA) is used as a planning tool in the initial stages of project conceptualization, planning, and design. Its intention is to identify or predict Project-related effects (based on results of scientific assessment and/or traditional knowledge), as well as standard and design mitigation strategies to avoid, reduce, or eliminate adverse environmental effects. The scope of the assessment and the methods used to prepare this EIA Registration document, including the characterization of the factors to be considered, and the details of the assessment of each valued component of the environment are provided below.

4.1 Scope of the Assessment

As noted in **Section 1.4.1.1**, the Project must be registered under the EIA Regulation. This registration document is intended to fulfill the requirements for registration of the Project under the provincial regulation, to initiate the EIA review of the Project. As described in **Section 1.4.1.2**, there are no known requirements for a federal impact assessment under the *Impact Assessment Act* since the Project is not located on federal land and its size does not exceed the threshold for a designated project as defined in the *Physical Activities Regulations* under that Act.

The Project assessed herein conservatively includes the replacement of up to three turbine-generator units, conducting repairs to or replacing the forebay bridge, replacement of the sluiceway bladder and forebay bladder, as well as structural repairs to the powerhouse, forebay, and tailrace concrete structures, as well as the ongoing operation of the refurbished Station for another 50 years following the completion of life extension activities.

The following is <u>not</u> part of the scope of this EIA Registration:

- The construction and operation of the recently completed new bypass road;
- The completion of other regular electrical maintenance activities associated with the operation and use of other mechanical and electrical components at the Station; or
- The eventual decommissioning and abandonment of the Station at the end of its useful service life, as those aspects will be assessed separately at a future time in accordance with the regulations and requirements in place at that time.

4.1.1 Selection of Valued Components

Valued components (VCs) are those components of the biophysical and socioeconomic environments that are of value or interest to regulatory agencies, the public, other stakeholders, and Indigenous peoples. VCs are typically selected for assessment on the basis of: regulatory issues, scientific concern, legislation, guidelines, policies, and requirements; input arising from consultation with regulatory agencies, the public, stakeholder groups, and First Nations; field reconnaissance; and professional judgment.

The VCs selected for this EIA Registration document, and the rationale for their selection in relation to the Project, are outlined in **Table 4.1.1**, below.

Table 4.1.1: Valued Components for the Project, and Rationale for their Selection

Valued Component (VC)	Rationale for Selection of the VC
Atmospheric environment	• Emissions of particulate matter (e.g., dust) and combustion gases related to Project activities may interact with the atmospheric environment and nearby receptors.
Acoustic environment	• Noise and vibration related to Project activities may interact with nearby receptors.
Groundwater	• The Project may have limited interactions with groundwater on a localized basis near the Nepisiguit River.
Surface water	• The Project may interact with the quality or quantity of surface water within Nepisiguit River as a result of a change of the hydrological regime due to Project activities or to temporary changes in water or sediment quality.
Fish and fish habitat	• Fish and fish habitat are protected by the federal *Fisheries Act*. The Project will interact with fish and fish habitat through the Project activities by temporarily altering fish habitat or through temporary changes in water quality or sediment quality.
Vegetation and wetlands	• The Project activities may interact with riparian vegetation (including flora species at risk and species of conservation concern) and may interact with unmapped riparian wetlands (should they be present).
Wildlife and wildlife habitat	• Physical alteration of the Project site during Construction may result in the loss of wildlife habitat, and Project activities may interact with wildlife (e.g., sensory disturbance due to Project activities), including wildlife species at risk and species of conservation concern.
Socioeconomic environment	• The Project will interact with labour and economy through the generation of employment and associated expenditures.
Heritage resources	• Heritage resources (e.g., archaeological, palaeontological, or built heritage resources) are protected under the New Brunswick *Heritage Conservation Act*. • Limited earth moving activities on the Project site may result in the potential accidental discovery of previously unknown heritage resources that may be present on the Project site.

Valued Component (VC)	Rationale for Selection of the VC
Traditional land and resource use	• The Project is located in the traditional Mi'kmaq territory and may have been visited/used by Wolastoqey people. It is known that the general area of the Project has historically been, and may be currently used by, Indigenous persons for practicing traditional activities such as hunting, fishing, trapping, and gathering through the practice of unextinguished Aboriginal and treaty rights. Further consultation with Indigenous peoples is required to determine the extent of potential traditional land and resource use of the area.
Effects of the environment on the Project	• Natural forces and other effects of the environment (such as climate change and other natural hazards or risks) may pose a risk to the Project components and their longevity, or cause delays in the Project.

The following sections provide a description of the methods of desktop and/or field studies that were required to assess the VCs detailed in **Table 4.1.1**, based on professional judgment, the nature of the Project, knowledge of the Project area, and previous experience on projects of a similar nature. In addition, the methods employed for the analysis of environmental effects are discussed.

4.1.2 Spatial Boundaries

The spatial boundaries of the assessment, which represent the area in which a potential effect could occur, will typically be based on natural system boundaries for biophysical VCs, or administrative/ political boundaries for socio-economic VCs. The assessment of potential environmental interactions with the VCs encompasses two spatial boundaries: the Project site and the local assessment area (LAA).

4.1.2.1 Project Site

The Project site is defined as the area of physical disturbance (or physical footprint) associated with the Project. Although the total land area of the properties associated with the Station is approximately 40.2 ha, the entirety of that area will not be disturbed by the Project, with only the areas of these properties that will be physically used to accomplish the Project. Therefore, the Project site on land consists of an area of approximately 40.2 ha upon which Project activities will be carried out, which includes all of the Station-related facilities as well as areas to be used as laydown/ temporary storage for the construction activities. In addition, NB Power owns a submerged water lot of the Nepisiguit River with an approximate area of 1.8 ha, a portion of which will be affected by Project activities (e.g., dewatering, cofferdam construction). The Project site that is subject to this EIA Registration was shown in **Figure 2.1.1**.

The Project site is the same for all VCs discussed within this EIA Registration document.

4.1.2.2 Local Assessment Area

The local assessment area (LAA) is defined as the maximum area where Project-specific environmental interactions can be predicted and measured with a reasonable degree of accuracy and confidence (i.e., the "zone of influence" of the Project phases on each VC). The LAA, which can vary by VC, is summarized for each VC in **Table 4.1.2**.

Table 4.1.2: Local Assessment Areas (LAA) for Valued Components

Valued Component	Local Assessment Area (LAA)
Atmospheric environment	A 1 km buffer around the Station, including the Project site.
Acoustic environment	A 1 km buffer around the Station, including the Project site.
Groundwater	A 500 m buffer around the Station, including the Project site.
Surface water	Approximate extent of the impoundment (approximately 500 m upstream of the Station) to approximately 500 m downstream of the Station, including 30 m of riparian area on each side of the Nepisiguit River.
Fish and fish habitat	Approximate extent of the impoundment (i.e., from the dam to approximately 500 m upstream of the Station) to approximately 500 m downstream of the Station, including a 30 m of riparian area on each side of the Nepisiguit River.
Vegetation and wetlands	For aquatic vegetation species, the LAA includes an approximate 500 m stretch of Nepisiguit River upstream and downstream of the dam, which is anticipated to experience changes in water levels (i.e., area to result in loss of vegetation through drying or flooding). For terrestrial vegetation species, the LAA includes the Project site and a 30 m stretch of land bordering the section of the Nepisiguit River within the LAA.
Wildlife and wildlife habitat	The Project site and 30 m of riparian area extending approximately 500 m upstream and 500 m downstream of the Station.
Socioeconomic environment	The Project site the Bathurst Parish Census Subdivision from Statistics Canada, which encompasses the rural community of Bathurst Mines and the Station.
Heritage resources	The Project site and 80 m of riparian area extending approximately 500 m upstream of the Station.
Traditional land and resource use	The Nepisiguit River and a 30 m riparian area on each side of the watercourse, extending upstream approximately 26 km to the Highway 430 crossing and downstream approximately 30 km to tidewater near the city of Bathurst.

4.1.3 Temporal Boundaries

Temporal boundaries vary according to the different Project phases and potential effects. In typical construction phases, specific construction-related effects are typically short-term (for example, effects related to the use of laydown areas for construction activities).

The temporal boundaries for the Project correspond to the timing of the Project phases as it was defined in the Project schedule in **Section 2.4**.

4.2 Environmental Assessment Methods

This EIA Registration document was developed in a two-step process, where the initial EIA Registration document was based on a desktop level assessment, which was followed by the completion of confirmatory field studies during appropriate seasonal windows to confirm the predictions of the desktop level EIA Registration. In general, this EIA Registration considers the following factors:

- Interactions between the physical activities associated with the Project;
- Mitigation measures that are technically and economically feasible and that would mitigate any anticipated significant adverse environmental effects of the Project, including requirements for follow-up studies or monitoring;
- The environmental effects of malfunctions or accidents that may occur in connection with the Project;
- Any change to the Project that may be caused by the environment; and
- Comments received from the public, Indigenous persons, regulatory agencies, or other stakeholders.

As a first step, Dillon uses a streamlined and focussed approach in the preparation of the analysis of interactions between the Project and VCs. During the environmental effects analysis, Project-VC interactions are first identified through a matrix table. If a Project-VC interaction is not identified, a rationale is provided to explain its exclusion from the assessment.

Following the identification of Project-VC interactions, mitigation and best management practices are outlined to lessen or eliminate the potential interaction between the Project and VCs. Then, the anticipated Project-VC interactions following the planned application of mitigation are characterized, and potential environmental effects as a result of these interactions are predicted. The environmental assessment methodology involves the following generalized steps.

- **Scope of VC** – This involves the scoping of the assessment for the VC, and includes a definition of the VC and a rationale for its selection and a description of temporal and spatial boundaries. This step relies upon the scoping undertaken by regulatory authorities; consideration of the input of the public, stakeholders, and First Nations (as applicable); and the professional judgment of the Study Team.
- **Existing Conditions** – This step involves the establishment of existing (baseline) environmental conditions for the VC, in the absence of the Project. In many cases, existing conditions expressly and/or implicitly include those environmental effects that may be or may have been caused by other past or present projects or activities that have been or are being carried out. Existing conditions were defined based on both desktop information sources as well as confirmatory field work in the Project site and LAA (where available). Field data that were not available at the time of writing the EIA Registration document will be documented in separate technical reports that will be submitted to the TRC, later during the EIA review.

- **Assessment of Project-VC Interactions** – Project interactions with each VC are assessed. The assessment includes:
    - A description of how a potential interaction could occur in the absence of mitigation,
    - A discussion of the mitigation and environmental protection measures that are proposed to avoid, reduce, or eliminate adverse interactions between the Project and the VC, and
    - A characterization of the interactions and prediction of potential environmental effects that could occur as a result of the interactions.

  All phases of the Project are assessed, as are accidents, malfunctions, and unplanned events. The evaluation also considers the effects of the environment on the Project.

- **Summary** – A summary of the assessment for the VC is provided, leading to an overall conclusion in respect of the interactions and associated effects of the Project on the VC. The summary also outlines the planned follow-up confirmatory field studies that is recommended for each VC in order to confirm the predicted environmental effects.

Biological and archaeological field studies to inform existing conditions were conducted during the spring to fall of 2021. Some further confirmatory field surveys may be completed prior to the start of the phased construction activities for the Project, if required. The results of the follow-up surveys will be made available to the New Brunswick Department of Environment and Local Government (NBDELG) in supplementary reports, as applicable.

5.0 Assessment of Environmental Interactions with the Project

The identification of potential interactions between the Project and the VCs will be undertaken in consideration of the nature of the Project and its planned activities.

5.1 Project Interactions with the Environment

The potential interactions with the surrounding environment have been considered in terms of each distinct Project phase and corresponding activities associated with the Project as planned. Accidents and malfunctions can be referenced in **Section 7.0**.

The initial screening (i.e., project interaction matrix) provided in **Table 5.1.1** below assists in determining if an interaction between the activities being carried out in each Project phase/activity of the proposed Project and the VC is possible. A qualitative rating system was used to evaluate the potential for interactions between the Project and the environment. One of the following two ratings was prescribed for each individual VC:

- An interaction between the Project and the environment could occur (which is identified with a checkmark in the matrix below), which are carried forward for further assessment; or
- No interaction occurs between the Project and the environment (which is identified by a blank cell in the matrix below), and therefore no further assessment is required and the issue is not discussed further.

Based on the Project description (refer to **Section 2.0**), the environmental setting (refer to **Section 3.0**), and the scope of the EIA (refer to **Section 4.0**), the potential interactions between the Project and the environment are summarized in **Table 5.1.1** below.

Table 5.1.1: Project Interactions with Valued Components (VCs) of the Environment

Valued Component (VC)	Project Phases				
	Construction				Operation
	Phase 1 Turbine-Generator Unit Replacements	Phase 2 Forebay Bridge Replacement or Repair	Phase 3 Sluiceway Bladder and Forebay Bladder Replacements	Phase 4 Structural Repairs to Powerhouse, Forebay, and Tailrace Concrete Structures	
Atmospheric Environment	✓	✓	✓	✓	
Acoustic Environment	✓	✓	✓	✓	✓
Surface Water		✓	✓		✓
Groundwater			✓		
Fish and Fish Habitat		✓	✓	✓	✓
Vegetation and Wetlands	✓	✓	✓	✓	✓
Wildlife and Wildlife Habitat	✓	✓	✓	✓	✓
Socioeconomic Environment	✓	✓	✓	✓	✓
Heritage Resources		✓	✓		
Traditional Land and Resource Use	✓	✓	✓	✓	✓

Legend: ✓ = Potential interaction

In the table above, the interaction with a particular VC is identified when the interaction first occurs. VCs for which an interaction occurs are carried forward in the environmental effects assessment in **Sections 5.2** to **5.11**, below.

The following sections are organized by VC, and describe: the scope of each VC; their existing conditions (based on the qualitative assessments described herein); potential interactions that could occur between the Project and the VC in the absence of mitigation; planned mitigation to offset, reduce or eliminate predicted adverse interactions; and residual interactions that may occur after the implementation of site specific and general mitigation and lead to unmitigated environmental effects. Furthermore, and where applicable, specific follow-up or monitoring plans to verify the effects predictions or the effectiveness of mitigation will be described.

5.2 Atmospheric Environment

The potential interactions between the Project phases and activities and the atmospheric environment are assessed in this section.

5.2.1 Scope of VC

The atmospheric environment is defined as the layer of air above the earth's surface to a height of approximately 10 km. The atmospheric environment includes climate, air quality, and greenhouse gases (GHGs), which are characterized as follows:

- Climate is characterized by the long-term historical seasonal weather conditions of a region, which can include temperature, humidity, precipitation, sunshine, cloudiness, and winds, among other parameters. Statistical climate data are typically averaged over a period of several decades, and climate "normals" are normally based on historical averages and extremes over a period of 30 years;
- Air quality is characterized by the composition of the ambient air, including the presence and quantity of air contaminants in the atmosphere in comparison to applicable air quality objectives; and
- Project-based releases of greenhouse gases (GHG), such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), are typically used as an indicator of the potential for environmental interactions with climate change. It is understood that GHG releases on a global scale from both natural processes/sources and human activities are increasing global concentrations of GHGs in the atmosphere and they contribute to climate change.

The atmospheric environment has been selected as a valued component (VC) because the atmosphere helps maintain the health and well-being of humans, wildlife, vegetation, and other biota. The atmospheric environment constitutes a VC due to:

- Emissions of contaminants to the atmosphere during construction activities which may present a pathway for humans and biota to be exposed to air contaminants;
- Provisions regarding air contaminant emissions under the New Brunswick *Air Quality Regulation*; and
- Releases of GHGs and their accumulation in the atmosphere influence global climate and may affect emission reduction targets for GHGs that have been set or are being developed federally and provincially.

This assessment of the atmospheric environment considers the air contaminants that are typically associated with this type of project, which are regulated provincially (and in some cases federally). These air contaminants are generated from fuel combustion and fugitive dust generated from the movement of mobile equipment and material transfers during various construction activities. For the Project components and activities assessed herein, combustion gases (including but not limited to sulphur dioxide [SO_2], carbon monoxide [CO], and nitrogen oxides [NO_x]), and particulate matter (PM) are considered to be the potential contaminants of concern relating to air quality. Releases of GHGs from the combustion of fossil fuels in mobile equipment are also considered in relation to the potential for interactions with climate change. Lastly, local meteorology and microclimate effects associated with the temporary dewatering of the impoundment will be considered.

Air quality in New Brunswick is regulated pursuant to the New Brunswick *Air Quality Regulation* under the *Clean Air Act*, administered by the New Brunswick Department of Environment and Local Government (NBDELG). Federally, the main instrument for managing air quality is the *Canadian Environmental Protection Act* (CEPA) as well as Canada-Wide Standards developed by the Canadian Council of Ministers of the Environment (CCME). In addition, the Canadian Ambient Air Quality Standards (CAAQS) developed by the CCME provide additional ambient limits for nitrogen dioxide (NO_2), and additional standards for SO_2, fine particulate matter, and ozone (O_3) have been proposed. New Brunswick's *Air Quality Regulation* specifies maximum permissible ground-level concentrations for five air contaminants, namely total suspended particulate (TSP), CO, SO_2, NO_2, and hydrogen sulphide (H_2S) as presented in **Table 5.2.1** below.

Table 5.2.1: Ambient Air Quality Standards in New Brunswick

Air Contaminant	Averaging Period	New Brunswick *Air Quality Regulation* Maximum Permissible Ground Level Concentration (µg/m^3)
Total suspended particulate (TSP)	24 hour	120
	Annual	70 (geometric mean)
Carbon monoxide (CO)	1 hour	35,000
	8 hour	15,000
Nitrogen dioxide (NO_2)	1 hour	400
	24 hour	200
	Annual	100
Sulphur dioxide (SO_2)	1 hour	900
	24 hour	300
	Annual	60
Hydrogen sulphide (H_2S)	1 hour	15
	24 hour	5

Source: New Brunswick Regulation 97-133.

The local assessment area (LAA) for the atmospheric environment includes the Project site as well as a 1 km buffer around the Project site, in recognition of the very localized nature of potential interactions between the Project and the atmospheric environment.

5.2.2 Existing Conditions

Existing (baseline) conditions with respect to the atmospheric environment are discussed in this section.

5.2.2.1 Climate

New Brunswick has a humid continental climate, with slightly milder winters on the Gulf of St. Lawrence coastline. Northern New Brunswick experiences a subarctic climate, particularly in the more elevated area in the far north. Conversely, southern New Brunswick experiences a more moderate maritime climate than the northern or central parts of the province since the Bay of Fundy never fully freezes, thus moderating the winter temperatures and providing generally cooler summer temperatures compared to other inland locations.

Climate normals from the nearest representative weather station (located in Nepisiguit Falls) are presented in **Table 5.2.2** below. Data at the Nepisiguit Falls weather station are limited to temperature and precipitation; therefore, climate normals from the Bathurst (A) Airport weather station are also presented in **Table 5.2.3** to capture additional parameters.

Table 5.2.2: Climate Normals, Nepisiguit Falls, New Brunswick (1981-2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature Normals, Nepisiguit Falls (1981 - 2010)													
Daily Average (°C)	-12.0	-9.9	-4.2	2.8	9.8	15.4	18.6	17.9	13.1	6.5	-0.1	-7.2	4.2
Daily Maximum (°C)	-6.0	-3.5	1.8	8.0	16.0	21.7	24.5	23.8	18.8	11.5	3.8	-2.3	9.8
Daily Minimum (°C)	-17.9	-16.3	-10.2	-2.6	3.7	9.1	12.6	11.9	7.3	1.6	-3.9	-12.1	-1.4
Precipitation Normals, Nepisiguit Falls (1981 - 2010)													
Rainfall (mm)	20.7	12.8	22.9	53.8	93.8	83.6	105.8	93.6	76.5	88.2	67.0	31.8	750.4
Snowfall (cm)	65.9	46.8	50.2	21.8	2.2	0.0	0.0	0.0	0.0	2.0	22.4	55.5	266.9
Precipitation (mm)	86.6	59.6	73.1	75.6	96.0	83.6	105.8	93.6	76.5	90.2	89.4	87.4	1,017.3

Source: Canadian Climate Normals (GOC 2021a)

Table 5.2.3: Climate Normals, Bathurst A, New Brunswick (1981-2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature Normals, Bathurst A (1981 - 2010)													
Daily Average (°C)	-10.8	-9.4	-3.8	3.2	9.7	15.9	19.1	18.2	13.5	6.8	0.8	-6.0	4.8
Daily Maximum (°C)	-5.5	-3.7	1.5	8.3	15.7	22.2	24.8	24.3	19.6	11.8	4.9	-1.5	10.2
Daily Minimum (°C)	-16.2	-15.1	-9.0	-1.9	3.6	9.5	13.2	12.1	7.4	1.7	-3.4	-10.4	-0.7
Precipitation Normals, Bathurst A (1981 - 2010)													
Rainfall (mm)	19.8	11.6	20.3	48.0	101.1	96.9	100.8	82.0	84.2	115.6	80.6	34.5	795.4
Snowfall (cm)	72.3	60.3	70.9	29.2	2.0	0.0	0.0	0.0	0.0	7.3	24.4	67.2	333.5
Precipitation (mm)	85.1	66.5	88.8	77.7	103.1	96.9	100.8	82.0	84.2	122.9	103.8	98.4	1,110.1
Wind Normals, Bathurst A (1981 - 2010)													
Maximum Hourly Wind Speed (km/h)	54	61	48	52	46	46	48	46	41	52	56	65	N/A
Direction of Maximum Hourly Speed*	NE	SW	W	W	S	SW	W	SW	NE	SW	NW	SW	N/A

Source: Canadian Climate Normals (GOC 2021b)

Notes:

* indicates the direction from which the wind is blowing

N/A = not applicable

5.2.2.2 Ambient Air Quality

The air quality can be defined from historical air quality monitoring conducted in the region for the key contaminants of concern.

There is no ambient air quality monitoring station within the immediate vicinity of the Project, nor one regionally that collects data for every parameter. Therefore, for the purpose of this EIA Registration, air quality is characterized using data collected regionally from the NBDELG's ambient air quality monitoring station at Bathurst (approximately 30 km north of the Station) as the closest representative station to the Project site. The Bathurst monitoring station measures only particulate matter less than 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), and ground-level ozone (O_3). Other ambient air quality monitoring stations are operated by industry in the general area (including at Belledune, Millbank, and Miramichi), but these stations are mainly to monitor contaminants levels arising from emissions from specific industries in those areas, and as such are not intended to represent general background air quality as is desirable here.

The maximum measured concentrations from the Bathurst monitoring station data for the respective averaging periods of each contaminant during 2019, as reported in the NBDELG's most recent ambient air quality monitoring report titled "2019 Air Quality Monitoring Results" (NBDELG 2021a) and its supplementary data report (NBDELG 2021b), are presented in **Table 5.2.4**. It is noted that since the data presented in these reports is in graphical form (i.e., raw numerical values are not presented in the reports), the values in the table below are interpolated from the graphs and should be considered approximate.

Table 5.2.4: Ambient Monitoring Data – 2019 Maximums – Bathurst Air Quality Monitoring Station

Air Contaminant	Averaging Period	Maximum Ground-Level Concentration Recorded in 2019
Particulate matter less than 2.5 microns ($PM_{2.5}$)	24 hour	21 µg/m^3
Nitrogen dioxide (NO_2)	1 hour	56 µg/m^3 (30 ppb)
Ground-level ozone (O_3)	1 hour	114 µg/m^3 (57 ppb)

The maximum reported values for each contaminant are below their respective ambient air quality standards and objectives.

NBDELG (2021a) identifies provincial "air zones" which assists the Department in managing air quality in these regions. The Northern Air Zone, within which the Station is located, is described as follows:

> *"The northern air zone is situated along New Brunswick's northern coastline and includes most of the province's border with Quebec. The area is largely rural, but contains a number of towns and villages. The largest community is Bathurst, with a population of approximately 12,000.*
>
> *Because there are no major urban centers in the northern air zone, it does not experience many of the air quality issues associated with big cities (such as smog from heavy traffic).*
>
> *The air zone is home to major industrial emitters in Atholville (AV Group Pulp Mill), and Belledune (NB Power Belledune Generating Station, and Glencore Brunswick Lead Smelter).*
>
> *These facilities emit a variety of air contaminants including sulphur dioxide, nitrogen dioxide, and fine particulate matter, which can impact air quality in nearby communities and the broader region.*
>
> *The Glencore smelter in Belledune is the largest sulphur dioxide emitter in the province, and the NB Power Belledune Generating Station is the second largest."* (NBDELG 2021a)

In consideration of this information and the data presented in **Table 5.2.4** above, the ambient air quality in the Bathurst region (and by extension, the Nepisiguit Falls area) is generally good to very good, mainly due to the low population density and rural character of the area and lack of large industrial emission sources in the area.

5.2.2.3 Greenhouse Gases

Greenhouse gas emissions in Canada totalled 730 megatonnes (Mt CO_2e, as CO_2-equivalents) in 2019 (ECCC 2020a), as published in Canada's most recent annual report on GHG emissions. Total GHGs for New Brunswick were 14.3 Mt CO_2e in 2017 (the most recent year for which New Brunswick data are available publicly), whereas they were 16.1 Mt CO_2e in 1990 and 20.0 Mt CO_2e in 2005 (CER 2021). Since 2005, New Brunswick has seen a 28.5% decrease in total GHG emissions.

5.2.3 Assessment of Potential Interactions between the Project and the Atmospheric Environment

The environmental effects of the Project on the atmospheric environment are assessed in this section.

5.2.3.1 Potential Interactions

Without mitigation, the Project could interact with the atmospheric environment in the following ways:

- Emissions of combustion gases from the combustion of fossil fuels by heavy equipment and vehicles associated with on-site construction activities and from transport of materials on- and off-site could result in air contaminants that could disperse in the atmosphere to off-site receptors;
- Emissions of fugitive dust from unpaved roads and parking areas, from earth moving activities, and from transport of materials on- and off-site during construction activities could be generated and disperse in the atmosphere to off-site receptors;
- The combustion of fossil fuels from the operation of mobile equipment and on-site trucks during construction activities could result in emissions of greenhouse gases; and
- Localized, reversible microclimate effects during dewatering of the impoundment.

5.2.3.2 Mitigation

The following mitigation measures will be implemented to reduce environmental effects on the atmospheric environment:

- Vehicles and equipment will be maintained in proper working order;
- Limiting the conduct of intrusive activities to 7:00 a.m. to 7:00 p.m., Monday to Saturday excluding holidays;
- Instituting and following a non-idling policy; and
- Use of low sulphur fuel in combustion engines.

5.2.3.3 Characterization of Potential Interactions Following Mitigation

Interactions between the Project and the atmospheric environment are expected to be primarily related to the operation of heavy mobile equipment and vehicles as well as the transport of materials on- and off-site. These construction activities have the potential to result in changes to the local air quality through the generation of emissions of fugitive dust and particulate matter from material movement as well as combustion emissions associated with the heavy equipment.

Trucking of materials to site will include the delivery of materials such as coarse rockfill and gravel for the cofferdams as well as equipment. Heavy equipment is anticipated to include the following; it is noted that not all equipment will be operated at the same time:

- An excavator(s);
- A crane(s);
- A concrete truck(s) for structural repairs and pouring of concrete for the bridge;
- A bulldozer;
- A dump truck(s);
- A compactor(s);
- A flatbed truck(s) for equipment and supplies for the refurbishment; and
- A front-end loader(s) to be used to move materials as needed.

As outlined in **Section 2.3**, the Project phases and activities will be spread over an approximate eight-year period and all activities are of temporary nature, in addition to the Project footprint remaining the same. Furthermore, it is not likely all of these pieces of equipment will be operating simultaneously and continuously as listed, and it is more likely they will be used intermittently and as required following the individual Project phases.

Fugitive emissions of particulate matter (including dust) and those associated with fuel combustion in heavy equipment will largely be localized to the construction activities within the immediate area and within the Project site. Due to the very limited footprint of the Project, the temporary nature of the activities, the composition of the materials being handled (i.e., rockfill and gravel) in addition to the rural setting of the Project with the nearest residential receptor being approximately 150 m away, fugitive emissions, if any, are expected to be nominal, very localized, and are not anticipated to negatively contribute to local or regional air quality. In addition, given the relatively low magnitude of emissions associated with the Project, GHG emissions are expected to be low and unsubstantial for the scale of the Project.

Phase 3, as outlined in **Section 2.3**, requires the dewatering of the impoundment in the Nepisiguit River, and may create a temporary localized microclimate effect for the duration of the activity due to the different albedo of the exposed floor of the impoundment compared to that of the water surface when the impoundment is normally full. This may result in minor changes in temperature and wind circulation patterns on a very localized basis adjacent to the impoundment. However, this effect (should it occur) would be limited to the immediate vicinity of the impoundment and would not likely be distinguishable from current conditions at the nearest residence; in addition, the effect would be expected to be temporary and limited to the short period of time during which the impoundment is dewatered.

5.2.4 Summary

The effects of the Project activities on ambient air quality due to fugitive dust and emissions from equipment are expected to be temporary, intermittent, very localized and minimal, using standard mitigation as identified. It is unlikely that Project-related emissions will exceed New Brunswick air quality standards or objectives.

Greenhouse gas emissions from the Project are not anticipated to materially contribute to overall emissions in the region or the province, given the low magnitude of these emissions and given that emissions are temporary.

In light of the above, the potential interactions between the Project and the atmospheric environment are not expected to be substantive.

Given the relatively straightforward and transient nature of the Project, the limited activities arising from it, and the anticipated lack of substantive interactions with the atmospheric environment, no follow-up or monitoring is proposed to monitor environmental interactions with the atmospheric environment.

5.3 Acoustic Environment

The potential interactions between the Project and the acoustic environment are assessed in this section. We first provide an overview of the existing environment as it pertains to the acoustic environment, then conduct an evaluation of potential interactions on the acoustic environment, and then present a plan for follow-up and monitoring during key activities associated with the Project.

5.3.1 Scope of VC

The acoustic environment focuses on ambient noise within the local assessment area (LAA, defined later), both natural and human-made. It is identified as a valued component (VC) because noise is defined as a contaminant in the New Brunswick *Air Quality Regulation – Clean Air Act*, and noise levels may be of concern in relation to human health, socioeconomic values, and potential disturbance of ecological functions.

Potential changes to the acoustic environment may affect humans and wildlife. Components considered under this VC are sound pressure levels that could affect nearby receptors. Unwanted changes to sound pressure levels that are nuisance is generally referred to as noise.

The assessment of potential interactions on the acoustic environment is characterized by the type, frequency, intensity, and duration of noise (unwanted sound) in the outdoor environment. Vibration, or oscillation in matter that may lead to noise or stress in materials of adjacent structures, is also considered as an element of the acoustic environment. Given the nature of the Project phases and activities to be carried out for the Project, substantive sources of vibration are not expected, and as such the focus of the discussion below shall be largely on noise.

Specific regulations or guidelines related to sound quality have not been established in New Brunswick and may be addressed through the Certificate of Approvals process for industrial facilities under the *Air Quality Regulation*. In the absence of local guidance, the following generally accepted criteria that have been applied in Certificates of Approval in New Brunswick in the past are proposed for the purpose of the assessment (Glynn, M., pers. comm., 2012):

- 65 A-weighted decibels (dBA) measured as a 1-hour equivalent sound level (Leq) from 06:00 to 22:00 (daytime); and
- 55 dBA measured as a 1-hour Leq from 22:00 to 06:00 (nighttime).

The local assessment area (LAA) for the acoustic environment includes the Project site as well as a 1 km buffer around the Project site, in recognition of the very localized nature of potential interactions between the Project and the acoustic environment.

5.3.2 Existing Conditions

The emission of sound waves from natural and manmade sources, their propagation through the atmosphere, and their detection through auditory or other means at a noise sensitive receptor in the ambient environment characterizes sound quality. Sound pressure level in units of A-weighted decibels (dBA) is the typical measure of sound. The A-weighting scale is the most commonly used scale for expressing the perception of audible noise by humans.

The Station is located in Nepisiguit Falls, in the rural area of Bathurst Mines, approximately 30 km south of the city of Bathurst, Gloucester County, in northern New Brunswick. The nearest potential acoustic sensitive receptors are located approximately 150 m north from the Project site along Nepisiguit Falls Road (refer to **Figure 5.3.1**). For the purpose of this assessment, a residential receptor is defined as a residential building, a nursing home, hospital, school, or daycare facility. The Project site is located approximately 2 km to the east of the former Bathurst Mine #6.

Since no baseline noise monitoring has been completed for the Project, the baseline noise levels assumed to be present at or near the Station were estimated using guidance provided by Health Canada (2017), Alberta Energy Regulator (AER 2007), and United States Environmental Protection Agency (USEPA 1974). Based on the population density (Statistics Canada 2017) and the lack of other potential substantive noise sources within 1,000 m of the Project site, it was determined that the noise levels within the Project area would be expected to be typical of a quiet rural area, with estimated baseline sound levels of approximately 45 dBA (USEPA 1974 and Health Canada 2017).

Given the low population density of the area (3.2 people/km^2 [Statistics Canada 2017]) and the fact that all the potential acoustic sensitive receptors are located on one road that is also used to access the Station, baseline noise monitoring is not considered to be necessary to adequately characterize the baseline ambient sound levels.

[This page was intentionally left blank]

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

CLOSEST NOISE SENSITIVE RECEPTOR TO THE FACILITY

FIGURE 5.3.1

- Nepisiguit Falls Generating Station
- Road
- Watercourse
- Closest Noise Sensitive Receptor
- NB Power Property
- Adjoining Properties
- Waterbody

0 12.5 25 50 m

SCALE 1:2,000

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-09-24

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F531_ClosestNoiseSensitiveReceptor.mxd

5.3.3 Assessment of Potential Interactions between the Project and the Acoustic Environment

The potential interactions and effects of the Project on the acoustic environment are assessed in this section.

5.3.3.1 Potential Interactions

Without mitigation, the Project could produce changes in the acoustic environment at nearby acoustic sensitive receptors as follows:

- Noise emissions from materials delivery and heavy equipment movement (e.g., cranes, boom truck) for the turbine-generator unit replacements at the Station;
- Noise emissions from earth moving, heavy equipment movements, and materials delivery during the forebay bridge repair/replacement;
- Noise emissions from earth moving, heavy equipment movements, and materials delivery during the sluiceway bladder and forebay bladder replacements (especially cofferdam construction and removal);
- Noise emissions from heavy equipment used during the structural repairs to the powerhouse, forebay, and tailrace concrete structures; and
- Limited noise emissions during the operation of the Station, as currently.

The typical sound levels of the area of approximately 45 dBA is considered to be the baseline scenario and representative of existing environmental conditions.

5.3.3.2 Mitigation

The following mitigation measures will be used to control nuisance noise during upgrade and construction activities as well as the operation of the Station:

- Scheduling restrictions, where possible (or alternative mitigation implemented), to ensure that construction activities with elevated noise emissions occur during the daytime (7:00 a.m. to 7:00 p.m.), Monday to Saturday excluding holidays. Non-noise producing activities (e.g., indoor work) may be conducted at any time, however; limit activities that include generating impulsive noise (e.g., jack hammering) to the daytime (7:00 a.m. to 7:00 p.m.) Monday to Saturday excluding holidays, without exception. Only non-intrusive activities will occur during the nighttime (7:00 p.m. to 7:00 a.m.) or on Sundays or holidays;
- Vehicles and equipment shall be maintained in good working order with quality mufflers;
- Requirements to minimize noise will be included in the tender documents;
- Regular discussions will be conducted with workers and contractors on noise minimization practices;
- NB Power will ensure drivers know the designated vehicle routes, parking locations, no-idling policy, normal delivery hours, and use of engine brakes policy; and

- Use of standard NB Power communication procedures, via telephone or email, to communicate with local residents who have questions or concerns related to Project-related matters including noise.

5.3.3.3 Characterization of Potential Interactions Following Mitigation

Potential interactions following the application of mitigation are assessed below. New Brunswick has no specific regulations or guidelines for noise; therefore, the generally accepted criteria of 65 dBA for the daytime will be used, since noise-producing activities will not occur during nighttime.

Phase 1: Turbine-Generator Unit Replacements

Activities related to the removal and replacement of one or more of the turbine-generator units as part of the Project have the potential to result in noise emissions with potential disturbance effects for humans or wildlife outside of the Project site. The initial turbine-generator unit will be replaced in 2022, with the other two units possibly being replaced in 2024. As part of the unit replacement phase, a new garage door will be installed in the transformer bay, along the downstream side of the powerhouse.

It is assumed that the majority of replacement will be conducted largely inside the powerhouse at the Station and will not generate any external noise. However, to determine the potential interactions the replacement activities have on nearby receptors, acoustic modelling of the potential sound emissions and their associated levels at the nearest discrete residential receptor (located approximately 100 m north of the property and 155 m north west of the powerhouse) was undertaken. Modelling was conducted for the removal of equipment and replacement.

The United States Department of Transportation, Federal Highway Administration Roadway Construction Noise Model (RCNM) (USDOT 2006) was used to predict noise levels from the replacement activities. While the model was initially designed to predict the change in sound levels from the construction of highways, it has been used throughout Canada and the United States on a wide variety of construction sites. Preliminary replacement information indicates that cranes and flatbed trailer will be utilized in the replacement phase. A list of anticipated construction equipment, and the measured sound pressure levels (USDOT 2006) associated with them, is provided in **Table 5.3.1**.

Table 5.3.1: Typical Construction Equipment Sound Pressure Levels during Phase 1 (USDOT 2006)

Description	Maximum (Lmax, dBA measured at 15 m from the equipment)	Assumed Number of Each Type of Equipment Used During Construction
Crane	85	1
Flatbed Truck	84	1

The RCNM was used to predict the equivalent sound level (Leq) at the closest receptor previously mentioned. The RCNM predicted that the Leq for the residential receptor located at 2040 Nepisiguit Falls Road was 55 dBA, which is below the accepted criteria of 65 dBA. The number and types of each equipment operating at a given time were presented in **Table 5.3.1**. The actual external replacement activities for the turbine-generator units will be limited to a few days' duration each year while the old unit is removed from the building and stored or loaded onto a flatbed truck as well as when the new unit is offloaded from a truck and moved into the building. The remaining work to prepare for the removal and installation of the new turbine-generator units will be done inside the building, with no anticipated external noise being produced.

It is assumed that some of replacement activities will occur during the evening and night as well on weekends, but these activities will be limited to work inside the building and will not produce external noise.

Phase 2: Forebay Bridge Replacement/Repair

Activities related to the removal and replacement or repair of the forebay bridge during 2022 have the potential to potential to result in noise emissions with potential disturbance effects for humans and wildlife outside of the Project site. For the purposes of the acoustic assessment, it was assumed Option 1 – Replace with Single-Span Bailey Bridge will be the selected option, since it involves a greater number of heavy equipment types compared to repairing the existing bridge.

Once again using the RCNM, the potential acoustic effects from the forebay bridge replacement were evaluated at the closest residential receptor, located approximately 100 m north of the bridge at 2040 Nepisiguit Falls Road.

A list of anticipated construction equipment, and the measured sound pressure levels (USDOT 2006) associated with the bridge replacement, is provided in **Table 5.3.2**.

Table 5.3.2: Typical Construction Equipment Sound Pressure Levels during Phase 2 (USDOT 2006)

Description	Maximum (Lmax, dBA measured at 15 m from the equipment)	Assumed Number of Each Type of Equipment Used During Construction
Crane	85	1
Flatbed Truck	84	1
Dump Truck	84	1
Compactor	80	1
Excavator	85	1

The RCNM predicted that the Leq for the residential receptor located at 2040 Nepisiguit Falls Road was 65 dBA, which is at the accepted criteria of 65 dBA. However, the modelling conservatively assumes that all the equipment listed in **Table 5.3.2** is operating at the same time. It is expected that the excavator, compactor, and dump truck will only be used during the construction of the laydown area, while the crane and flatbed truck will be on-site for the installation of the new Bailey bridge. As such, these modelling results are conservative.

Phase 3: Sluiceway Bladder and Forebay Bladder Replacements

Activities related the removal and replacement of sluiceway bladder are scheduled to take place in 2023 and has the potential to potential to result in noise emissions with potential disturbance effects for humans and wildlife outside of the Project site. The replacement of the forebay bladder is not expected to occur until approximately 2030. The replacement of both bladders will involve the construction of a cofferdam, and its subsequent removal following the replacements.

It was assumed for this assessment that the cofferdams will be constructed of gravel and rockfill only, with no pile driving required as part of the work.

A list of anticipated construction equipment, and the measured sound pressure levels (USDOT 2006) associated with the forebay bridge replacement/repair is provided in **Table 5.3.3** and will be used in the RCNM to model the potential acoustic effects from the bladder replacements.

Table 5.3.3: Typical Construction Equipment Sound Pressure Levels during Phase 3 (USDOT 2006)

Description	Maximum (Lmax, dBA measured at 15 m from the equipment)	Assumed Number of Each Type of Equipment Used During Construction
Front End Loader	80	1
Dump Truck	84	2
Excavator	85	2

The RCNM predicted that the Leq for the residential receptor located at 2040 Nepisiguit Falls Road was 65 dBA, which is at the accepted criteria of 65 dBA. However, the modelling conservatively assumes that all the equipment listed in **Table 5.3.3** is operating at the same time. It is expected that the excavator, compactor, and dump truck will not be used continuously. In reality, the construction and later removal of the cofferdams will be a relatively short-term event that will occur over a period of a few weeks to a few months. As well, the cofferdams will be constructed at a lower elevation than the residential receptors, with the terrain providing shielding which will further reduce the noise impacts. Additional mitigation is not recommended at this time; instead, ongoing communications and liaison with the local residents will occur during the construction and removal of the cofferdams.

In addition, a crane will be needed to remove the old bladders and move the new bladders to their intended location, but since these activities will not occur at the same time as the construction of the cofferdams, noise emissions from bladder removal and installation will not overlap with those activities. Noise levels generated during the replacement of the bladders is expected to be similar in nature as the noise levels generated during the turbine-generator unit replacement phase (Phase 1). Predicted sound power levels from the RCNM for the residential receptor located at 2040 Nepisiguit Falls Road were 55 dBA, which is below the accepted criteria of 65 dBA.

Phase 4: Structural Repairs to Powerhouse, Forebay, and Tailrace Concrete Structures

The structural repairs have the potential to generate noise emissions, with potential disturbance effects for humans. The work taking place underwater is not expected to have the potential to generate noise that could disturb humans or wildlife. Therefore, the assessment focuses on structural repairs to be conducted on the terrestrial (above water) components of the Station. Though much of the old concrete removal is likely to be conducted by manually chipping away old concrete, the work is conservatively assumed to involve the use of jack hammers, concrete trucks, and compressors.

A list of anticipated equipment to be used during this phase and the measured sound pressure levels (USDOT 2006) is provided in **Table 5.3.4** and will be used in the RCNM to model the potential acoustic effects from the structural repairs.

Table 5.3.4: Typical Construction Equipment Sound Pressure Levels during Phase 4 (USDOT 2006)

Description	Maximum (Lmax, dBA measured at 15 m from the equipment)	Assumed Number of Each Type of Equipment Used During Construction
Jack Hammer	85	1
Concrete Trucks	85	1
Compressor	80	1

The RCNM predicted that the Leq for the residential receptor located at 2040 Nepisiguit Falls Road was 64.5 dBA, which is at the accepted criteria of 65 dBA. Though a jack hammer is not planned for the Project, if it were to be used, the work using the jack hammer would be expected to be periodic noise source and would not be operating continuously.

Operation

Once the Project phases and activities are complete, operation of the Station will resume in much the same manner as it does today. The current operation of the Station is not known to be particularly noisy, and in fact little noise can be perceived at the fence line of the Station since all mechanical equipment including turbine-generator units, compressors, and the like are located within buildings at the Station and there are no noise-producing activities conducted outside the Station's buildings on a routine basis. Therefore, noise associated with the operation of the Station following the Project phases and activities is not expected to be substantive, and is not discussed further.

5.3.4 Summary

During the life extension activities for the Station, sources of noise are expected to be primarily related to operation of heavy equipment and related replacement and upgrade activities. Life extension-related activities have the potential to result in changes in local noise levels due to the operation of heavy equipment. Noise levels associated with replacement/upgrade activities are expected to be fairly localized, short-term, and reversible. As such, and in consideration of the noise modelling results being at or less than the recommended levels provided in guidance from regulatory agencies, the potential interactions of the Project-related activities on the acoustic environment are not expected to be substantive. Periodic noise monitoring may be conducted during construction activities as spot-checks to ensure compliance with noise guideline levels and/or in response to noise complaints.

5.4 Groundwater

The potential interactions between the Project and groundwater resources are assessed in this section.

5.4.1 Scope of VC

Water is essential for life on Earth. As humans, we need water for drinking, bathing, sanitation, recreation, and for the production of food and goods. Fish, wildlife, and vegetation also rely on the availability of water to live and flourish. Changes in the availability of water or the quality of the water may affect the lives of people and other living things.

Groundwater is considered a valued component (VC) because it is an important part of the hydrologic cycle through infiltration of precipitation or surface water, and it is important to local ecosystems and for potable water supplies. There is potential for groundwater to be affected by the Project through changes in groundwater quality or quantity.

In general, groundwater flows from recharge areas (areas of high elevation) to discharge areas (areas of low elevation), which are commonly lakes, streams, and rivers. Groundwater is contained in aquifers, which are geological units such as gravels, sands, or fractured bedrock. The natural quality of the groundwater contained in aquifers varies depending on the geochemical composition of the material (i.e., soil, sediment and/or bedrock) in which the water flows.

5.4.1.1 Regulations and Policies Relevant to Groundwater

Where applicable, the Project will adhere to standard provincial and federal government legislation and associated regulations, including the following:

Federal

- Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines; and
- Guidelines for Canadian Drinking Water Quality (GCDWQ) – administered by Health Canada (rev. 2020).

Provincial

- *Clean Water Act* – administered by the New Brunswick Department of Environment and Local Government (NBDELG); and
- *Clean Environment Act* – administered by the NBDELG.

The construction of potable wells and the extraction of groundwater is regulated under the New Brunswick *Clean Water Act* and associated *Water Well Regulation* and *Potable Water Regulation*. Groundwater sources used as public drinking water supplies are protected under the *Wellfield Protected Area Designation Order - Clean Water Act.*

Objectives for the quality of surface water and groundwater as a source of drinking water are provided in Health Canada's *Guidelines for Canadian Drinking Water Quality* (GCDWQ) (Health Canada 2020). Though not having force of law unless formally adopted by provincial legislation, these guidelines provide guidance to decision-makers with respect to the potability of drinking water for human use.

The local assessment area (LAA) for groundwater is defined as an approximate 500 m radius surrounding the Project site, in recognition of the localized effect of construction disturbance on groundwater.

5.4.2 Existing Conditions

The surficial geology of the area consists of loamy lodgement till, minor ablation till, silt, sand, gravel and rubble generally between 0.5 m and 3 m thick (Rampton 1984). Depending on the permeability of the till, it can be used as a localized aquifer for groundwater.

The bedrock in the area is a volcanic-based bedrock, described as thick-bedded dacitic to rhyolitic quartz feldspar crystal tuff, and is called the Nepisiguit Falls Formation. The formation may also include subvolcanic intrusions and lava-like pyroclastic flows (Wilson 2014). This bedrock can be fractured and be an aquifer for groundwater and a conduit for groundwater movement.

Based on the geology and topography of the local area in the vicinity of the Station, groundwater is locally expected to flow towards the Nepisiguit River, while regional groundwater is generally expected to flow towards Chaleur Bay and the Gulf of St. Lawrence.

Potable water in the Nepisiguit Falls/Bathurst Mines area is provided by individual private wells. The closest residential home with an assumed groundwater-sourced residential well is located approximately 150 m from the Station; as such, there is a potential for Project-related activities to affect local groundwater quality and/or quantity.

A desktop review of the NBDELG Online Well Log System (OWLS; NBDELG 2021c) was completed to determine the number of potable wells located within a two kilometre radius of the Station. It should be noted that the radial search is property based, and the OWLS database will return wells that are affiliated with any property in which a portion of the property falls within the search radius. Therefore, the wells discussed may be located beyond the two kilometre search radius surrounding the Project Site. Another important limitation of the OWLS database is that it includes only wells that were completed after 1994; thus, there may be other wells present in an area if they were commissioned prior to that year.

The OWLS query yielded results for 16 water wells within a two kilometre radius surrounding the Project site (refer to **Figure 5.4.1**). The construction details of these wells as documented in the OWLS database are summarized in **Table 5.4.1** below.

Table 5.4.1: Well Construction Details for 16 Wells from the NBDELG OWLS Database within 2 km of the Station

Well Identification	Overall Well Depth (m)	Well Casing Diameter (cm)	Well Casing Depth (m)	Estimated Safe Yield (L/min)[1]
DW1 (4814)	54.86	15.24	6.1	9.1
DW2 (17456)	24.38	15.24	10.06	13.65
DW3 (19747)	24.38	15.24	5.79	4.55
DW4 (20175)	60.96	15.24	5.79	4.55
DW5 (31395)	24.38	15.24	5.79	2.28
DW6 (31397)	18.29	15.24	5.79	22.75
DW7 (31398)	18.29	15.24	5.79	2.28
DW8 (33498)	85.34	15.24	5.79	2.28
DW9 (34585)	80.77	15.24	6.1	4.55
DW10 (37197)	42.67	15.24	21.34	136.5
DW11 (90074800)	-	-	-	-
DW12 (90074900)	39.62	-	-	227.5
DW13 (90200400)	60.96	15.24	8.53	4.55
DW14 (91392500)	74.68	20.32	3.96	4.55
DW15 (91393100)	62.48	15.24	5.79	2.28
DW16 (91451300)	31.39	15.24	6.1	4.55

Notes:

- means no data are available.

[1] The estimated safe yield is based upon the well driller's estimate at the time of well drilling and development and may not represent the long-term sustainability of the well.

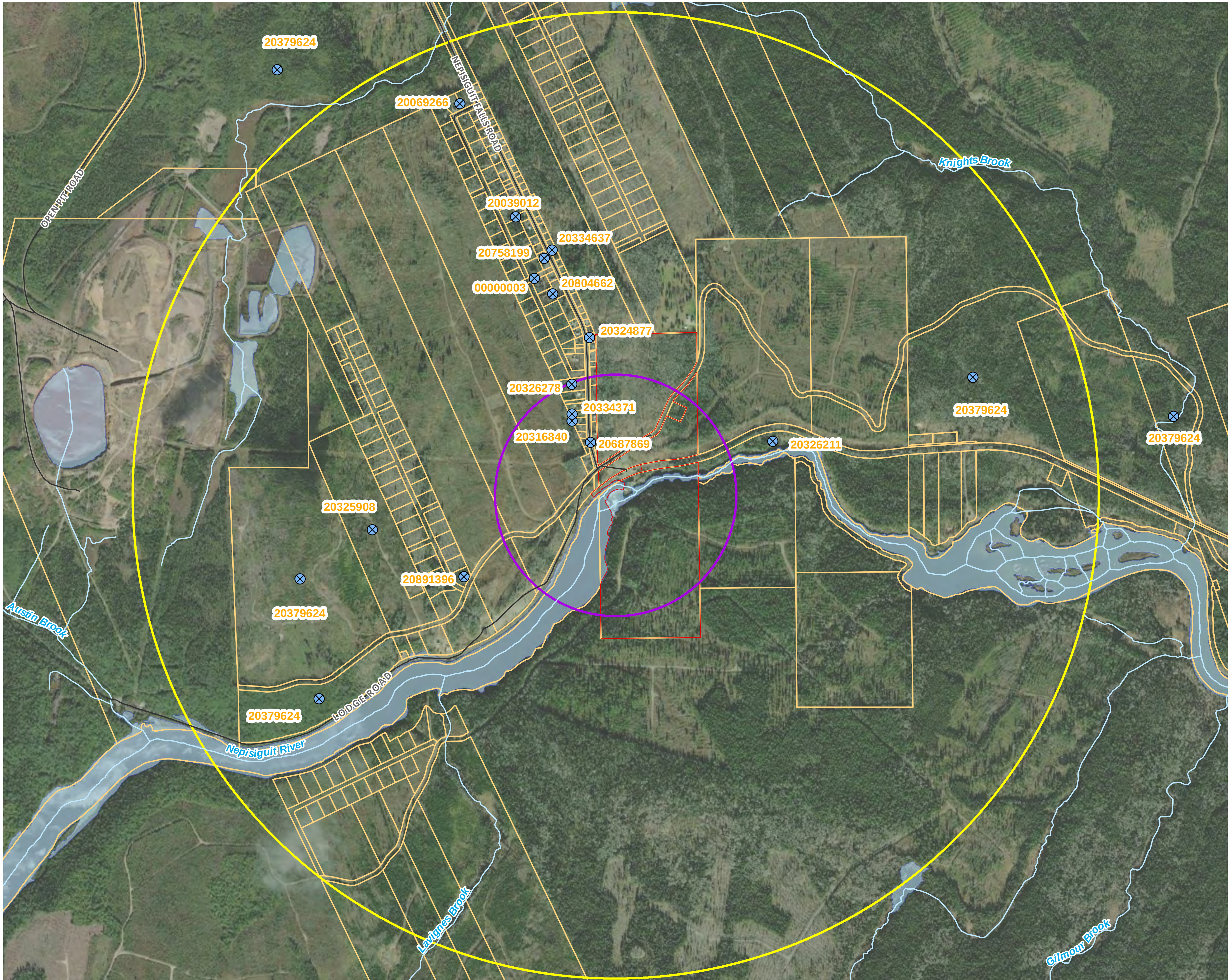
[This page was intentionally left blank]

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

POTABLE GROUNDWATER WELLS WITHIN 2 KM OF THE STATION

FIGURE 5.4.1



- PIDs with at least one Potable Well (NBDELG OWLS Database)
- 20379624 Parcel Identifier Number
- Road
- Watercourse
- NB Power Property
- Project Location 500 m Radius
- Project Location 2 km Radius
- Adjoining Properties
- Waterbody

0 0.125 0.25 0.5 km

SCALE 1:15,500

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: AG
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-09-14

Observed stratigraphy is recorded by the licensed well drillers during each well installation. Available information regarding observed stratigraphy as documented in the OWLS database is presented below in **Table 5.4.2**.

Table 5.4.2: Observed Stratigraphy of 16 Wells in the NBDELG OWLS Database within 2 km of the Station

Well Identification	Depth of Top of Zone (m)	Depth of Bottom of Zone (m)	Stratigraphy[1]
DW1 (4814)	0	2.13	Brown Gravel
	2.13	4.27	Brown Fractured Rock
	4.27	54.86	Brown and Grey Rock
DW2 (17456)	0	0.3	Brown Topsoil
	0.3	6.71	Brown Sand
	6.71	8.84	Brown Till
	8.84	24.38	Grey Shale
DW3 (19747)	0	3.96	Brown Sand
	3.96	9.75	Grey Slate
	9.75	10.36	Brown Slate
	10.36	17.68	Grey Slate
	17.68	17.98	Brown Slate
	17.98	24.38	Grey Slate
DW4 (20175)	0	2.44	Brown Sand
	2.44	3.05	Brown Broken Slate
	3.05	5.79	Grey Quartz
	5.79	6.71	Red Quartz
	6.71	60.96	Grey Quartz
DW5 (31395)	0	0.3	Brown Till
	0.3	3.66	Brown Shale
	3.66	6.4	Grey Slate
	6.4	6.71	Brown Slate
	6.71	21.34	Grey Slate
	21.34	21.95	Brown Slate
	21.95	24.38	Grey Slate
DW6 (31397)	0	0.91	Brown Till
	0.91	18.29	Brown Clay
DW7 (31398)	0	1.52	Brown Boulders
	1.52	18.29	Grey Slate
DW8 (33498)	0	1.22	Brown Till
	1.22	1.83	White Granite
	1.83	85.34	Grey Slate

Well Identification	Depth of Top of Zone (m)	Depth of Bottom of Zone (m)	Stratigraphy[1]
DW9 (34585)	0	3.05	Brown Gravel
	3.05	12.19	Grey Unknown
	12.19	12.8	Brown Rock
	12.8	16.15	Grey Rock
	16.15	17.37	Brown Rock
	17.37	20.73	Grey Rock
	20.73	21.64	Brown Rock
	21.64	38.71	Grey Rock
	38.71	39.32	Brown Rock
	39.32	44.2	Grey Rock
	44.2	45.11	Brown Rock
	45.11	46.33	Grey Rock
	46.33	46.94	Brown Rock
	46.94	49.38	Grey Rock
	49.38	51.82	Dark Grey Rock
	51.82	57.3	Grey Rock
	57.3	59.44	Brown Rock
	59.44	77.72	Grey Rock
	77.72	78.33	Sand and Rocks
	78.33	80.77	Grey Rock
DW10 (37197)	0	5.49	Grey Sandstone
	5.49	19.81	Brown Clay
	19.81	36.58	Grey Sandstone
	36.58	42.67	Brown Clay
DW11 (90074800)	-	-	-
DW12 (90074900)	0	15.24	Grey Gravel
	15.24	39.62	Grey Gravel
DW13 (90200400)	0	0.61	Brown Gravel
	0.61	6.1	Brown Shale
	6.1	7.32	Brown Slate and Clay
	7.32	12.19	Brown Quartzite
	12.19	60.96	Grey Quartzite
DW14 (91392500)	0	0.61	Brown Gravel
	0.61	1.22	Brown Topsoil
	1.22	3.66	Brown Till
	3.66	74.68	Grey Quartz

Well Identification	Depth of Top of Zone (m)	Depth of Bottom of Zone (m)	Stratigraphy[1]
DW15 (91393100)	0	4.88	Brown Mud, Stone, and Shale
	4.88	13.11	Grey Quartzite
	13.11	57.61	Grey Slate
	57.61	62.48	Brown Slate
DW16 (91451300)	0	4.88	Brown Sand
	4.88	10.97	Grey Gravel
	10.97	11.89	Brown Rock
	11.89	31.39	Grey Rock

Notes:
- means no data are available.
[1] The stratigraphy is based upon the well driller's observations at the time of well drilling and development.

In accordance with the New Brunswick *Clean Water Act*, the OWLS database does not attribute any reported water quality analytical data to its corresponding well. The OWLS search completed as part of this assessment did not yield analytical data for any of the 16 wells found within the search. Therefore, no information is available about groundwater quality in the general vicinity of the Station.

5.4.3 Assessment of Potential Interactions between the Project and Groundwater

The potential interactions between the Project and groundwater resources are assessed in this section.

5.4.3.1 Potential Interactions

The Project site is in and immediately adjacent to the Nepisiguit River, which is a regional discharge zone for groundwater.

The Project site is built at a natural waterfall and groundwater flow and quantity is unlikely to be adversely affected by the Project, given its limited disturbance and limited scope of activities to be carried out. However, there is a potential for Project-related activities to affect local groundwater quality. Given that there is no planned blasting, and that excavations associated with the Project are limited, the potential interactions with groundwater are expected to be minimal.

Without mitigation, the Project may interact with groundwater in the following ways:

- Construction activities at the Project site have a potential to cause increased turbidity and changes in groundwater quality in nearby groundwater wells. This can occur when vibration from machinery during construction activities release trapped sediment/silt into the aquifer. These small particles of sediment/silt can cause unfavourable discolouration as well as alter water chemistry;
- Changes in the water level of the Nepisiguit River as a result of construction and associated temporary lowering of the impoundment are not anticipated to have a noticeable effect on the quantity of available water in local aquifers. Since the Nepisiguit River is the local

discharge point for groundwater, as the water level in the impoundment drops and rises with the construction, local groundwater aquifers directly connected to the Nepisiguit River may also fluctuate, but is anticipated to be inconsequential when considering the natural seasonal fluctuations of the water table;

- Water quality could be affected by accidental release of lubricants and/or fuels at the Project site during construction activities. This could occur if wells that extract groundwater from aquifers directly connected to the Nepisiguit River were to contain lubricants and/or fuels, or any other chemicals used or stored on the Project site; and
- Acid rock drainage occurs through exposure of sulphide-rich rocks in oxidizing environments. However, not all sulphide-containing rocks generate acid under these conditions. Due to the local bedrock geology and the proximity to the former Brunswick Mine (massive sulphide deposit), a potential exists for acid rock drainage to occur if bedrock, outside of the Nepisiguit River channel, is exposed during construction activities. Generation of acid can reduce the pH of any natural water sources and affect aquatic life.

5.4.3.2 Mitigation

The following mitigation measures are proposed as a means to reduce the effects of potential interactions identified above:

- Potable wells located within a 500 m radius will be sampled each year (if permitted by the homeowner) prior to carrying out Project-related activities in order to establish a baseline and to evaluate the potential for changes in water quality of the local aquifer. Subject to the homeowner providing permission to do so, monitoring of potable wells will include completing a questionnaire with the homeowner and collecting a representative water sample from their well. Samples be collected prior to the initiation of construction activities for a particular year to establish baseline data, as well as in the event that a homeowner notices a change in water quality;
- As water levels in the Nepisiguit River return to their pre-existing state prior to construction activities (i.e., once water levels in the impoundment return to normal levels following the completion of construction activities that require dewatering of the impoundment), any anticipated minor fluctuations in water levels within local aquifers should also normalize to the pre-existing conditions;
- Spill response measures should be implemented during construction activities to properly deal with any Project-related contaminant releases. The extent of area potentially affected by a release depends on the type and volume of the contaminant; and
- Based on the extent of the Project site and that the area is underwater during the majority of the year, any acid rock drainage that might occur would have negligible adverse effects on water quality during or after the completion of the construction activities. However, special attention should be to limiting the amount of time that sulphide-containing bedrock is exposed during dewatering activities.

5.4.3.3 Characterization of Potential Interactions Following Mitigation

Construction activities at the Project site have a potential to increase turbidity and change the quality of groundwater in local aquifers. Potable well questionnaires and sampling can be used to monitor groundwater quality throughout the construction phases. It is unlikely that groundwater quality changes will occur during the construction process, but if they do occur, they would be isolated to close proximity to the Project site, and they are not anticipated to continue post-construction.

Water levels within the Nepisiguit River have a potential to affect groundwater quantity in groundwater aquifers within close proximity to the Project site. As the dewatering portion of the infrastructure upgrades come to a finish, the water levels in the Nepisiguit River as well the local aquifers should return to equilibrium without negatively impacting localized groundwater regimes.

Water quality of local groundwater could also be affected by spills that occur on the Project Site. Spill measures will be in place during construction activities in the event of an incident, and lubricants, fuels, and chemicals will be properly stored until removed from site upon completion of the Project. Accidents, malfunctions, and unplanned events are discussed further in **Section 7.0**.

Acid rock drainage can arise when sulphide-rich rocks are exposed to oxygen. The local bedrock geology of the Nepisiguit Falls/Bathurst Mines area contains thick-bedded dacitic to rhyolitic quartz feldspar crystal tuff, which can contain sulphide-bearing minerals. Acid generation is unlikely to occur during most of the infrastructure upgrades due to bedrock remaining underwater and the limited nature of any ground-breaking or earth moving activities associated with the Project phases and activities. During dewatering activities, however, if acid generation were to occur, the amount generated would likely have negligible effect on the pH of local groundwater aquifers, due to the minimal extent of the Project site and limited nature of the physical disturbance associated with the Project phases and activities.

5.4.4 Summary

Sixteen potable water wells are known to be located within 2 km of the Station. The quality of groundwater in these wells has a potential to be affected by infrastructure upgrades and/or spills associated with these activities. Spill response measures will be put in place during all infrastructure upgrades, and potable well questionnaire and sampling prior to, during, and post-construction is recommended to ensure water quality is not disrupted.

Changes in water levels in the Nepisiguit River on a temporary basis are not anticipated to cause measurable changes in water quality or quantity of local aquifers.

In consideration of the nature of the Project, the environmental setting including the limited potable water wells in close proximity to the Project site, and the limited extent of ground disturbing activities associated with the Project phases and activities, and in light of the proposed mitigation, substantive interactions of the Project with groundwater are not expected.

NB Power will conduct pre- and post-construction sampling of selected nearby potable water wells (within 500 m, for those homeowners that desire such sampling) during the infrastructure upgrades to verify the Project has not adversely affected groundwater quality. Sampling during construction can also be undertaken if a homeowner notices changes in the quality or quantity of their well water.

5.5 Surface Water

Water is essential for life on Earth. As humans, we need water for drinking, bathing, sanitation, recreation, and for the production of food and goods. Fish, wildlife, and vegetation also rely on the availability of water to live and flourish. Changes in the availability of water and the quality of the water may affect the lives of people and other living things.

5.5.1 Scope of VC

Surface water consists of wetlands, watercourses (mapped and unmapped), water bodies, and surface water drainage channels that are within the Project site or within the areas that may be potentially affected by the Project. Surface water was selected as a valued component (VC) based on the importance of the resource to both humans and biota, including its importance in supporting fish and fish habitat and other aquatic life, and because of the potential for these resources to be affected by the Project through changes in surface water quality and/or quantity.

The potential interactions of the Project with surface water quantity and quality resulting from the upgrades to the Station are considered for this VC. Assessment of interactions with the surface water VC are particularly important components due to the potential for impacts along the Nepisiguit River. This VC includes water levels, flows, surface water quality, and sediment quality. Discussion will include upgrades to the Station that may affect surface water. Potential interactions with the VC are discussed within the context of repairing and upgrading the equipment and structures of the Station.

Potential interactions of the Project with the VC during the construction and at the completion of the life extension activities are discussed. The potential interactions with the quantity or quality of surface water include:

- Potential change in surface water quantity, including:
    - Water flow pattern changes – interaction with or change to water levels, depths, and velocities;
    - Flow retention and management;
    - Sediment transport; and
    - Shoreline stability.
- Potential changes in surface water or sediment quality.

5.5.1.1 Regulations and Policies Relevant to Surface Water

Where applicable, the Project will adhere to standard provincial and federal government legislation and associated regulations and guidelines, including the following related to surface water:

Federal

- *Canadian Environmental Protection Act* (CEPA) – administered by Environment and Climate Change Canada (ECCC);
- *Fisheries Act* - administered by both Fisheries and Oceans Canada (DFO) and ECCC, the Act has requirements in relation to surface water, such as requirements prohibiting harmful alteration, disruption or destruction (HADD) of fish habitat (administered by DFO), requirement for flow maintenance for fish passage (administered by DFO), and prohibiting the release of deleterious substances (administered by ECCC);
- Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines (CCME 1999); and
- Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada 2020) – administered by Health Canada (rev. 2020).

Provincial

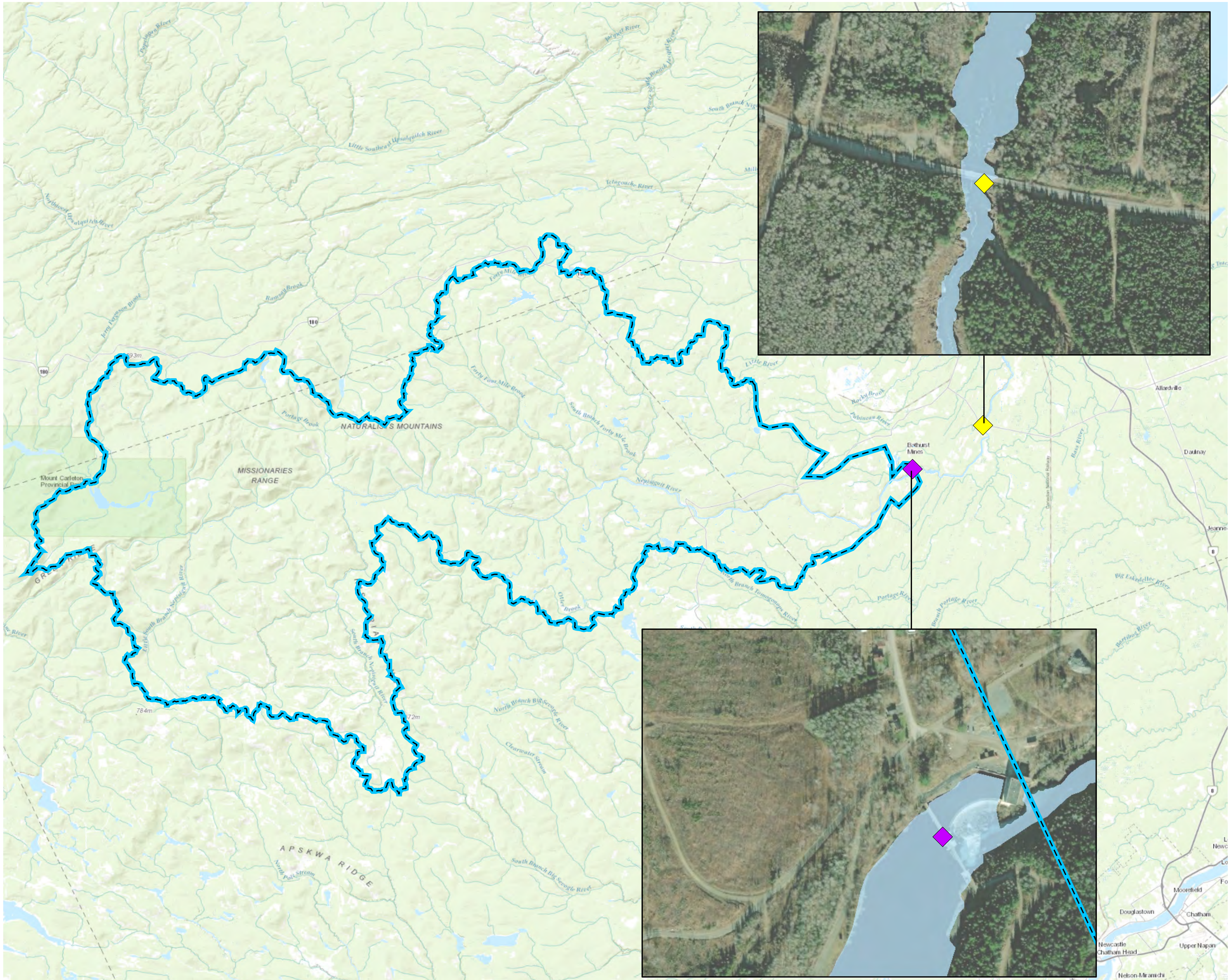
- *Clean Water Act* – administered by the New Brunswick Department of Environment and Local Government (NBDELG); and
- *Clean Environment Act* – administered by the NBDELG.

Watercourses and areas meeting the definition of a wetland in New Brunswick are regulated by the New Brunswick *Clean Water Act* including its *Watercourse and Wetland Alteration Regulation*, and the New Brunswick "Wetlands Conservation Policy" (NBDNRE-NBDELG 2002). Surface water supplies used as public drinking water sources are protected under the *Watershed Protected Area Designation Order – Clean Water Act.*

Objectives for the quality of drinking water are provided in Health Canada's "Guidelines for Canadian Drinking Water Quality" (Health Canada 2020). Additionally, the Canadian Council of Ministers of Environment's (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG FWAL) (CCME 1999) provide environmental quality objectives for protecting fish from lethal and sub-lethal effects. Though not having force of law unless formally adopted by provincial legislation, these guidelines provide guidance to decision-makers with respect to the suitability of water for various uses as well as the potability of drinking water for human use.

5.5.2 Existing Conditions

The Station is located approximately 30 km south of Bathurst at Nepisiguit Falls, in the community of Bathurst Mines. The Nepisiguit River and has a total contributing watershed of approximately 1,840 km^2 (ECCC 2021), which consists of predominantly undeveloped wooded terrain, shown in **Figure 5.5.1**. The Nepisiguit River flows through the city of Bathurst before discharging to the Bathurst Harbour, leading to the Chaleur Bay and ultimately to the Gulf of St. Lawrence.



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

UPPER NEPISIGUIT RIVER WATERSHED AND LOCATION OF HYDROMETRIC STATIONS

FIGURE 5.5.1

- Nepisiguit River below bridge, Route 360 Water Quality Data Station (ID #582)
- Nepisiguit River at Nepisiguit Falls Hydrometric Station (ID #01BK003)
- Waterbody
- Upper Nepisiguit River Watershed

0 2,875 5,750 11,500 meters

SCALE 1:350,000

N S E W

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: CB
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641
STATUS: DRAFT
DATE: 2021-09-21

5.5.2.1 Water Levels

The Station is built atop a natural waterfall on the Nepisiguit River called Nepisiguit Falls, which drops approximately 30 m. The Station's powerhouse is located at an overall elevation of approximately 107.5 m amsl. The existing dam structure has a total head of approximately 30 m. During the summer months, the normal operating range is 104 to 105 m amsl (NB Power 2010a). A minimum operating level of 103.9 m must be maintained in the impoundment. This elevation was the minimum level required to ensure flow at the Brunswick Mine's freshwater intake, which is approximately 1.6 km upriver (NB Power 2010a); since the mine has been decommissioned, maintaining this minimum elevation is no longer required and is being phased out.

5.5.2.2 Flow Regime

As per NB Power's "Downstream Water Elevation Procedure" (NB Power 2010b), minimum flow downstream of the Station must be 8.5 m^3/s to support aquatic habitat downstream of the Station. If flows drop below 8.5 m^3/s, inflow and downstream flow must match, and the appropriate authorities must be notified. As stated in the procedure, there must be water flow downstream at all times (NB Power 2010b).

A review of regional hydrometric gauges in the vicinity of the dam was undertaken to determine the most appropriate method of analyzing river flows. The Nepisiguit River at Nepisiguit Falls hydrometric station (Station ID 01BK003) is located at the Station on the downstream side of the dam; therefore, it takes into account the influences of dam operations. Further details of the hydrometric station is provided in **Table 5.5.1** (ECCC 2021).

Table 5.5.1: Hydrometric Station Information Summary

Station ID	Station Name	Period of Record	Years of Complete Data	Drainage Area (km^2)	Regulation Type
01BK003	Nepisiguit River at Nepisiguit Falls	1921 - 2005	85	1,840	Regulated

A historical flow duration curve was prepared for the Nepisiguit River at Nepisiguit Falls hydrometric station using flow data from 1921 to 2005 (85 years). The flow duration curve is presented in **Figure 5.5.2**.

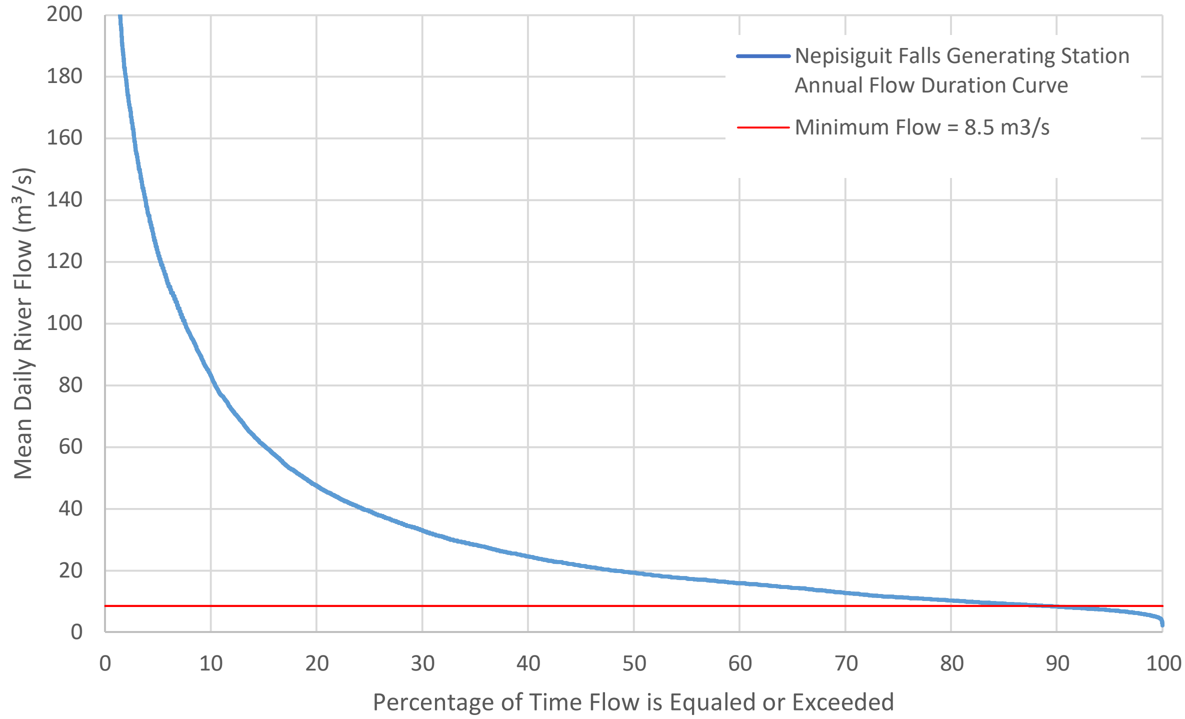


Figure 5.5.2: Historic Flow Duration Curve for the Nepisiguit River at Nepisiguit Falls Hydrometric Station (Observation Period of 1921-10-01 to 2005-05-31) (ECCC 2021)

The historic flow duration curve suggests that flow has historically exceeded the minimum 8.5 m^3/s approximately 89% of the time. Flow will need to be monitored to verify that levels do not drop below the minimum flow of 8.5 m^3/s during or after Construction of the Project phases.

5.5.2.3 Surface Water Quality

The Nepisiguit River moves sediments at or near the bottom of the river (referred to bed load) as well as sediment suspended within its flow (referred to as suspended load). The water carries nutrients that serve to nourish the environment and support the aquatic life within the Nepisiguit River. If the flow regime changes, water quality can also be impacted.

Historical Water Quality – Summary from NBDELG (NBDELG 2021e)

The New Brunswick Surface Water Monitoring Network (SWMN) provides water quality data for major rivers in New Brunswick. The *Nepisiguit River below bridge, Route 360 Station* (Station Number 582) is located approximately 12 km downstream of the Station, and was used to analyze historical water quality data in the vicinity of the Station (NBDELG 2021e). The location of this station is shown in **Figure 5.5.1**. The water quality monitoring station has an 18 year observation period from 2003 to 2021. It is important to understand that, since the monitoring station is located 12 km downstream from the generating station, water quality at Nepisiguit Falls may vary from that recorded at the monitoring station. The data for the NBDELG Nepisiguit water quality monitoring station are summarized below (NBDELG 2021e) and are compared to CCME Freshwater Aquatic Life (FWAL) guidelines (CCME 1999).

Water Temperature

The water temperature at the NBDELG water quality monitoring station between 2003 and 2021 reached a measured high of 28°C in July 2005, and a measured low of 0.1°C in November 2017. The average water temperature at the station was 14.8°C (NBDELG 2021e). Water temperature throughout the river will generally reflect seasonal conditions and will vary from the water quality monitoring station at other locations based on local conditions such as depth, flow, local sub-watershed character, and surface runoff and proximity to larger flow inputs. The CCME water quality guideline for temperature reflects a relative change in condition in the short and long term.

Dissolved Oxygen

Dissolved oxygen (DO) readings at the NBDELG water quality monitoring station between 2003 and 2021 reached the lowest concentration of 2 mg/L in September 2017, and the highest concentration of 16.1 mg/L in November 2017. The average DO value was 9.84 mg/L during the 18 year observation period. Approximately 93% of DO measurements were above the minimum CCME FWAL guideline of 6.5 mg/L (CCME n.d.). Four measurements taken in the summers of 2016, 2017, 2020, and most recently, on July 20, 2021, were below the minimum of 6.5 mg/L (NBDELG 2021e). Dissolved oxygen will also vary throughout the river depending on local conditions, particularly depth, time of year, vicinity to turbulent flow/aeration or to inputs with organic loading.

pH

Measurements of pH at the NBDELG water quality monitoring station between 2003 and 2021 remained within the CCME FWAL guideline (6.5 to 9) for the entire observation period (2003 to 2021). The minimum pH measurement was 6.94, recorded in October 2011, and the maximum pH was 7.8, recorded in July 2019. The average pH at the monitoring station was 7.41 (NBDELG 2021e).

Conductivity

Conductivity is a measure of how well water can conduct an electrical current. It increases as the concentration of ions (i.e., chloride, calcium, magnesium, sodium, nitrate, phosphate, and iron) increases in the water. Conductivity readings at the NBDELG water quality monitoring station from 2003 to 2016 fluctuated moderately between 23.8 and 44.1 microSiemens per centimetre (µS/cm), with one peak of 75.4 µS/cm in March 2004, indicating generally low solute levels (NBDELG 2021e).

Measurements of conductivity fluctuated significantly between 2016 and 2019 with peak conductivity occurring in the summer and fall months. The highest conductivity reading was 180 µS/cm on June 4, 2019. Since 2019, conductivity has remained relatively consistent, with moderate fluctuations between 37 µS/cm and 51 µS/cm (NBDELG 2021e).

Turbidity

Turbidity values at the NBDELG water quality monitoring station between 2003 and 2021 ranged from 0.3 to 2.9 nephelometric turbidity units (NTU), with an average of 0.65 NTU during the observation period. A peak of 93.5 NTU occurred on March 15, 2004. The majority of the elevated turbidity readings throughout a given year occurred from September to December (NBDELG 2021e). While there is not a specified turbidity range in the CCME FWAL guideline, it should be noted that increases in turbidity may pose a concern. The CCME FWAL guideline indicates a maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24 hour period), and a maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30 day period) (CCME 1999).

Trace Metals

Trace metals were evaluated for the duration of the NBDELG water quality observation period (2003 to 2021) and the results were summarized as follows:

- Total aluminum exceeded the CCME FWAL guideline of 100 µg/L approximately 8% of the time during the observation period; however, aluminum has not exceeded 100 µg/L in the past three years of data (NBDELG 2021e). Exceeding CCME FWAL guidelines for aluminum is not uncommon in New Brunswick rivers, and can be generally related to suspended sediment levels in stormflow when collected as a grab sample (unfiltered).
- The CCME FWAL guidelines for cadmium, copper, nickel, and lead are all based on a formula which uses water hardness to determine guideline concentration; they also have a minimum value, regardless of water hardness. Based on the range of water hardness at the Nepisiguit monitoring station, the minimum values stated in Appendix 5 of the CCME FWAL guideline for these metals were used. The values in the guidelines have not been exceeded since 2015 (NBDELG 2021e).

General Chemistry

- Total phosphorus ranged from 0.017 mg/L to 0.004 mg/L, with an average of 0.008 mg/L (NBDELG 2021e). These values are within the specified range of the CCME FWAL guideline, indicating oligotrophic (low nutrient) to mesotrophic (moderate nutrient) conditions. These guideline ranges define the range for phosphorus associated with a trophic state. Project interactions should target maintaining the existing trophic state (or CCME phosphorus guideline range).
- Nitrate has consistently been well below the CCME FWAL guideline at the water quality monitoring site.

2021 Water Quality – 2021 Field Work in Support of this EIA Registration

To support this EIA Registration, water quality sampling was conducted by Dillon biologists from July 6 to July 8, 2021. The in-situ water quality parameters were collected at two locations, both upstream of the Station within the impoundment, where the biologists could access the river safely. In-situ water quality parameters were measured within the top 0.5 m of the water surface using a calibrated YSI Pro Plus multimeter. The parameters sampled in the field are tabulated in **Table 5.5.2**.

Table 5.5.2: In-Situ Field Measured Water Quality Data, Nepisiguit Falls Generating Station Impoundment, July 6-8, 2021

Parameter	Low Field Value	High Field Value
pH	7.11	8.49
Temperature (°C)	21.5	21.7
DO (% saturation)	82.1	87.4
DO (mg/L)[1]	7.22	7.7
Total Dissolved Solids (TDS) (mg/L)	36.4	39
Conductivity (µS/cm)	52.6	56.1
Specific Conductivity (µS/cm)	56.4	59.8

Notes:
[1] Calculated Value

The DO values that were measured during the field surveys were slightly above the CCME DO requirement for early life stages of warm water biota (6 mg/L), but below the CCME DO requirement of early life stages of cool water biota (9.5 mg/L). Water temperatures were warm, as expected during this time of year, but It is noted that this is a near surface measurement and expected to be warmer than deeper waters. The pH values were within the CCME acceptable range of 6.5 to 9.0.

Two surface water quality samples were also collected in the impoundment and submitted to the Research and Productivity Council (RPC) laboratory in Fredericton, New Brunswick, which is accredited by the Canadian Association for Laboratory Accreditation (CALA). Samples were analyzed for general chemistry, trace metals, and petroleum hydrocarbons. The results of the surface water quality laboratory analyses were compared to the CCME FWAL guidelines. The results are summarized as follows:

- General chemistry concentrations were below the applicable CCME guidelines;
- The concentration of zinc (7 µg/L) was above the applicable CCME FWAL guidelines (4.9 µg/L) for both samples;
- Concentrations of other trace metals were below the applicable CCME FWAL guidelines; and
- Petroleum hydrocarbons were not detected in either of the surface water samples.

5.5.2.4 Sediment Quantity and Quality

While a partial dewatering of the impoundment is likely required to accomplish some of the Project phases and activities (e.g., cofferdam construction for the bladder replacements), the Project is not expected to result in large-scale mobilization and release of sediment that may be present at the bottom of the impoundment. However, increased velocity in the water during construction activities may cause the movement of some sediment. Additionally, turbines with a higher production capacity may result in an increase in flow through the turbines at times. This could cause sediment movement and erosion downstream of the Station.

There are no features of the Project that would be expected to alter sediment quality. Sediment samples were collected in the impoundment during the July 6-8, 2021 fish and fish habitat field program, but results were not yet available at the time of writing this EIA Registration.

5.5.3 Assessment of Potential Interactions between the Project and Surface Water

The potential interactions between the Project and surface water are assessed below.

5.5.3.1 Potential Interactions

The Project will consist of various phases and activities aimed at modernizing and repairing/replacing various components at the Station in order to extend their life. The environmental interactions of the Project during Construction may result in temporary physical changes both upstream and downstream of the dam, while upgrades to the Station may result in permanent changes both upstream and downstream of the dam. The following detailed potential interactions are based on the current understanding and goal of the Project (as described in **Section 2.3**).

Without mitigation, the Project may interact with surface water in the following ways:

- Dewatering of the work area during Construction may result in a temporary increase above the natural river flow, as additional water from the existing impoundment will be directed over the dam or through the units;
- Flows during Construction may change resulting in flows dropping below the required 8.5 m^3/s, on a short term basis;
- Water characteristics (e.g., temperature, DO, pH, water clarity, and chemical composition) may be temporarily affected;
- During Construction, heavy equipment activity may temporarily cause erosion. The failure of water or sediment control structures may allow sediment to enter the Nepisiguit River;
- Equipment used during Construction may affect water quality as a result of potential accidental spills of petroleum hydrocarbons and hydraulic fluids (see **Section 7.0**); and
- Increase in the size and capacity of the turbines may result in minor changes in upstream water levels and discharge rates through the dam. Potential increases in discharge due to the upgraded turbines may cause a potential for erosion or mobilization of sediments, over time.

Generally, some construction activities at the Station will result in temporary disturbance to the existing flow and level of water. However, these changes are expected to be short term during Construction. After Construction, the larger turbines may result in slight increases in discharge to the downstream reach. Potential changes to flow/water quality that may interact with fish and fish habitat are discussed in **Section 5.6**.

5.5.3.2 Mitigation

Standard mitigation and best management practices that are relevant to the surface water VC will be implemented for the life extension activities of the Project. These are based on normal operating procedures and regulatory requirements, and include mitigation specific to the surface water VC, such as the following:

- Application for a watercourse and wetland alteration (WAWA) permit for any alterations in, or within 30 m of, a watercourse or wetland (if present). A copy of the permit will be maintained on-site and the conditions of the permit will be followed;
- The area of disturbance of the Project will be limited to that which is absolutely necessary to achieve the Project purpose;
- Natural vegetation will be preserved when possible;
- The area of exposed soil will be limited, and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover) will be reduced through scheduled work progression;
- Erosion and sedimentation control structures (e.g., check dams, silt curtains) will be maintained throughout Construction and inspected regularly, in particular before and after heavy rain events as well as during the freshet. These structures will remain in place until the area is stabilized or naturally re-vegetated;
- Water released from the site will be monitored for quality to be consistent with suspended sediment limits specified by regulatory approvals, as applicable;
- Water flows will be monitored during Construction to maintain a minimum flow of 8.5 m^3/s in accordance with the NB Power policy (NB Power 2010b);
- Downstream reaches of the river below the dam will be periodically inspected through visual means so as to detect if erosion is occurring due to increased discharge during dewatering activities, and stabilization efforts will be identified in such an event;
- Dewatering of excavated areas will control release of sediment-laden water (e.g., filtration through vegetation or engineered erosion control devices);
- Construction material (e.g., gravel), if placed in or next to watercourses, will be free of debris, fine silt and sand, and chemical contaminants;
- A cofferdam will be used where feasible during the construction activities so as to enable the bladder replacements to be conducted “in the dry”;

- Disturbed areas will be returned to as near pre-construction grades as possible, where feasible;
- Exposed slopes with high potential for slumping or erosion will be stabilized as early as possible to prevent erosion;
- All fuels and lubricants used during Construction will be stored according to containment standards (e.g., secondary containment) in designated areas. Storage areas will not be located within 30 m of watercourses, wetlands (if present), or water supply areas (including the location of known private wells);
- Temporary storage of waste materials on-site will be located at least 30 m from watercourses, wetlands (if present), and water supply areas (including known private wells);
- Refueling of machinery will not occur within 30 m of watercourses and water supply areas (including known locations of private wells). Where stationary equipment is situated near a wetland (if present), special precautions will be implemented to prevent spills during refueling (e.g., absorbent pads located below nozzles and spill response kits located at the refueling location);
- Emergency response plans will be in place for spill response with spill kits and trained personnel present on-site at all times;
- Water flows and levels will be monitored after Construction with the addition of a larger turbine to maintain a minimum flow of 8.5 m^3/s through careful operations and management in accordance with the NB Power policy (NB Power 2010b); and
- Downstream reaches will be monitored during and after Construction for erosion due to increased flow through the turbines. Shoreline stabilization and bank repair may also be necessary if erosion rates are observed to be increasing.

5.5.3.3 Characterization of Potential Interactions Following Mitigation

Potential surface water impacts associated with the Construction phase of the Project are primarily related to the use of cofferdams at the existing spillways for water control during Construction. These impacts may include additional dewatering flows directed to the downstream reaches, and/or brief periods of water level equalization when directing discharge from one spillway to another.

It should be emphasized that these potential interactions are expected to be minor and brief since water level and flow in the work area are expected to stabilize relatively quickly (e.g., over a few hours to a few days). Furthermore, these potential interactions are only expected to occur during the Construction phase of the Project.

Potential surface water impacts associated with the Operation of the Project are related to the replacement of the existing turbine with a larger capacity unit. While the new unit has a higher nameplate generating capacity, on average water elevations are not expected to appreciably change relative to existing conditions. It is expected that the new turbines will make more efficient use of the water available, directing less water over the spillways and more water through the turbines. In general, it is expected that the net flow (turbine and spillway discharge) to the downstream reaches will remain relatively consistent with existing conditions under normal operating conditions.

To reduce these potential impacts, a set of mitigation measures have been identified as discussed in the previous section. A brief summary of mitigation measures relative to specific interactions are also provided in the sections below.

Water Levels, Discharge and Flow Velocity

During Construction, the use of a cofferdam in dewatering of the work area may result in a temporary increase above the natural river flow, as additional water from the existing impoundment will be released in a controlled manner over the dam, through the spillway, sluiceway, or the turbine-generator units. This release rate is expected to be minor and short lived (a few hours to a few days). There may also be brief periods of water level equalization during installation of the cofferdams. However, no erosion risk is expected due to this controlled release and the net flow to the downstream reaches will remain consistent with existing conditions.

After Construction is completed, while the net discharge through the dam is expected to remain similar to existing conditions, the upgraded turbines have the potential to slightly increase discharge to the downstream reaches during periods of peak production (e.g., drawdown of the impoundment or during the spring freshet). Increases in discharge from the dam can contribute to erosion in the downstream river reaches. However, it is expected increased discharges will be relatively minor and sustained for only short periods of time and the risk of erosion is considered low.

Water flows and levels will be monitored to maintain a minimum flow of 8.5 m^3/s through careful operations and management in accordance with the NB Power policy (NB Power 2010b). Additionally, the downstream reaches are to be regularly observed and monitored to identify changes in erosion rates along the downstream river reach. Shoreline stabilization and bank repair may also be necessary if erosion is observed.

Sediment Quality and Water Quality

Due to the potential for increases in downstream discharge during dewatering activities, sediment that might be present in the impoundment may become exposed on the banks of the watercourse and migrate downstream, contributing to temporary increases in suspended sediment levels or turbidity levels in the watercourse, and potentially affecting water quality. Similarly, failure of water and sediment control structures (e.g., cofferdam, silt curtains) may result in release of sediment to the watercourse during Construction. Water released from the Project site will be periodically monitored for quality to be consistent with suspended sediment limits specified by regulatory approvals, as applicable. Temporary storage of waste material, storage fuels and lubricants, and the refueling station for construction equipment will all be located at least 30 m away from the edge of the watercourse. Construction material that will be placed in the watercourse (i.e., gravel and rockfill for cofferdams) will be clean and approved for use in the watercourse, and lightly compacted by heavy equipment to reduce the risk of erosion.

5.5.4 Summary

In summary, the potential interactions associated with the Project, in repairing and upgrading structures of the Station, are related to temporary interactions with surface water during Construction and permanent short term interactions after Construction. Given the above, and in light of the Project as currently planned and planned mitigation to reduce or eliminate negative environmental effects, the potential interactions between the Project and surface water are not expected to be substantive.

5.6 Fish and Fish Habitat

The potential environmental effects of the Project on fish and fish habitat (including aquatic species at risk) are assessed in this section.

5.6.1 Scope of VC

The fish and fish habitat valued component (VC) includes aquatic life such as freshwater fish, benthic invertebrate species, and the habitat that supports them, as well as aquatic species at risk (SAR). Fish and fish habitat are considered a VC: because of their importance in supporting aquatic life; as a fisheries resource; as food source for humans, other fish, and wildlife; for providing recreational opportunities; and because they are of importance to the public, stakeholders, and Indigenous communities.

Indigenous peoples, and in particular the Mi'kmaq people of the Pabineau First Nation, have deep ties to the Nepisiguit River and the species within it including Atlantic salmon (*Salmo salar*), American eel (*Anguilla rostrata*), and brook trout (*Salvelinus fontinalis*) (Kryszko, R., pers. comm., 2021). Traditional land and resource use is described below in **Section 5.11**. For details on recreational fishing conducted within the Nepisiguit River, refer to **Section 5.9**.

Fish and fish habitat are protected through the federal *Fisheries Act* as well as the New Brunswick *Fish and Wildlife Act* and the New Brunswick *Watercourse and Wetland Alteration Regulation – Clean Water Act*. The federal *Fisheries Act* provides protection for all fish and fish habitat (DFO 2019). Section 35(1) of the *Fisheries Act* prohibits the harmful alteration, disruption or destruction (HADD) of fish habitat; Section 34.4(1) prohibits the death of fish by means other than fishing; and Section 36(3) prohibits the release of a deleterious substance into waters frequented by fish. Additionally, aquatic SAR are protected under both the federal *Species at Risk Act* (SARA) and New Brunswick *Species at Risk Act* (NB SARA). Although the Canadian Council of Ministers of Environment's (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG FWAL) (CCME 1999) do not have force of law on their own, they provide environmental quality objectives for protecting fish from lethal and sub-lethal effects.

In this EIA Registration document, we define "species at risk" (abbreviated SAR) as those species that are listed as "Extirpated", "Endangered", "Threatened", or "Special Concern" on Schedule 1 of SARA or on NB SARA. We also define "species of conservation concern" (abbreviated SOCC) as those species that are not SAR but are listed in other parts of SARA, NB SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of “extremely rare” [S1], “rare” [S2], or “uncommon” [S3]).

The fish and fish habitat VC has important connections to the surface water VC (**Section 5.5**) and the vegetation and wetlands VC (**Section 5.7**).

For the purpose of this EIA Registration document, the local assessment area (LAA) for fish and fish habitat consists of the area within the Nepisiguit River approximately 500 m upstream of the dam to approximately 500 m downstream of the dam, including the surrounding 30 m riparian buffers. The LAA is largely focused on the area upstream of the dam, since there will be little Project activity below the dam, although the LAA is extended to 500 m downstream of the dam to address the possible risk of downstream erosion as a result of increased velocities or downstream sedimentation from dewatering and cofferdam construction. The LAA is shown in **Figure 5.6.1**.

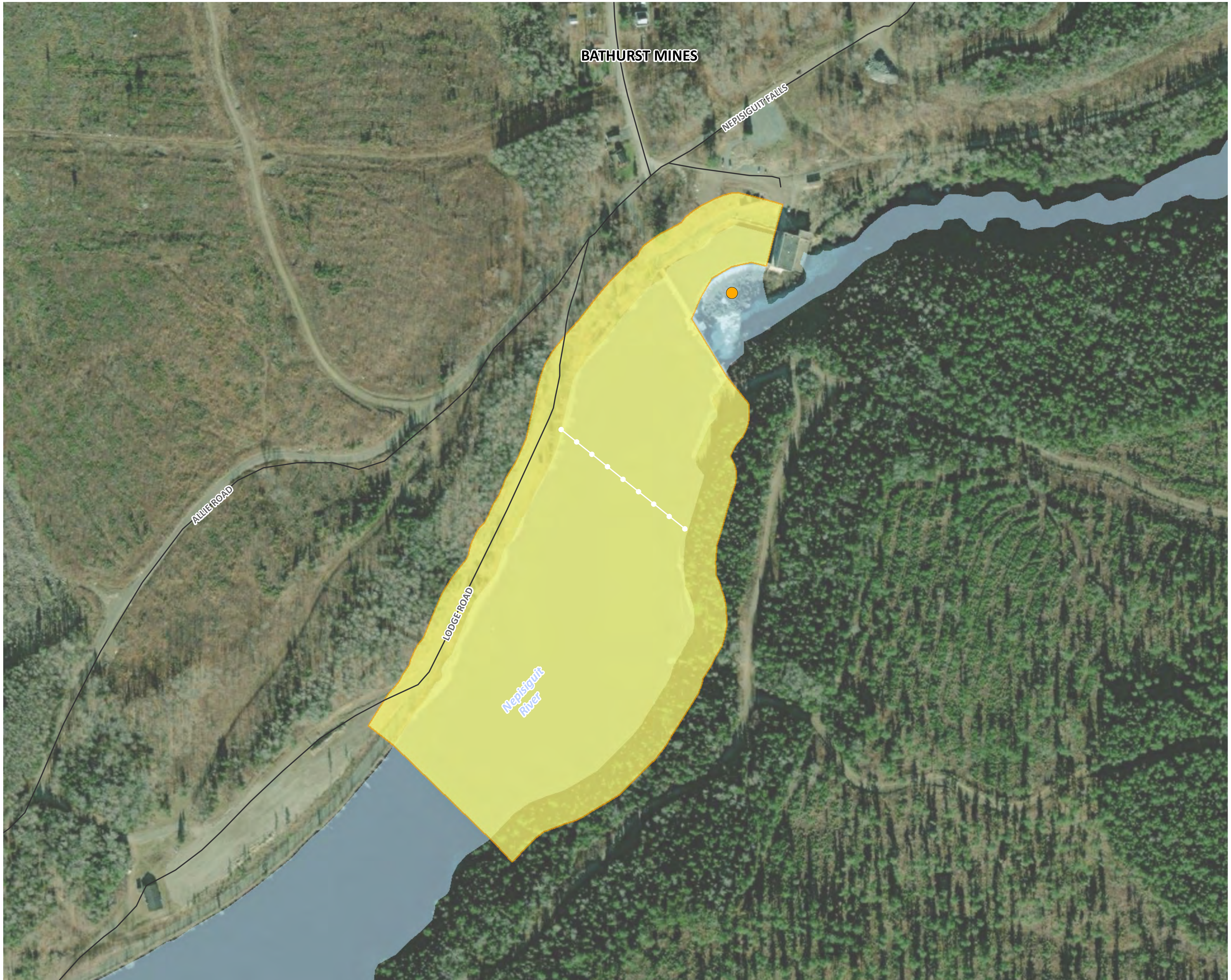
5.6.2 Existing Conditions

It is noted that a field evaluation of the area of the river between the forebay bridge and the dam, or the area immediately downstream of the Station, could not be conducted in support of this EIA Registration due to the inability to obtain safe access to these areas (i.e., the area immediately downstream the dam consists of a deeply incised steep gorge that would present safety hazards for such field work). Field work was focused on the area upstream of the forebay bridge and safety booms upstream of the dam.

As such, the information regarding the presence and characterization of fish and fish habitat within the entire Project site and LAA was derived from several reliable existing databases and secondary information sources, supplemented by a field evaluation of a subset of the LAA.

Dillon completed a desktop review of the following sources and data lists:

- AC CDC;
- Department of Fisheries and Oceans Canada (DFO);
- New Brunswick Department of Natural Resources and Energy Development (NBDNRED);
- New Brunswick Department of Environment and Local Government (NBDELG);
- The federal SARA;
- The provincial NB SARA;
- COSEWIC; and
- High resolution aerial photography (including the use of a small remotely piloted aircraft).



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

LOCAL ASSESSMENT AREA (LAA) FOR FISH HABITAT ASSESSMENT

FIGURE 5.6.1

- Project Location
- Road
- Safety Boom (approximate location)
- Local Assessment Area: Fish Habitat Assessment
- Waterbody

0 25 50 100 meters

SCALE 1:3,500

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB, ACCDC

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-10-06

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F561_LAA_FishHabitatAssessment.mxd

This desktop information is supplemented by a site-specific fish and fish habitat field program conducted by Dillon's aquatic field team, assisted by biologists from Boreal Environmental (Boreal), between July 6-8, 2021 to characterize fish habitat characteristics and fish species assemblages in the impoundment upstream of the Station. As noted above, due to the presence of a deep gorge and steep bedrock faces immediately downstream of the Station, a field program downstream of the Station was not conducted due to the inability to obtain safe access to the area.

Further information on fish and fish habitat conditions in the LAA is provided below, summarizing the desktop information and results of the field program conducted in 2021.

General

The Nepisiguit River is located in the northeastern portion of New Brunswick, flowing into Chaleur Bay at the city of Bathurst. The Nepisiguit River boasts numerous lakes and tributaries which provide access for tourism and recreation and have been historically important for hunting and fishing (refer to the socioeconomic environment VC in **Section 5.9**).

In general, fish communities have drastically changed within the Nepisiguit River system (and in systems throughout New Brunswick), primarily in abundance and diversity.

Aquatic species and assemblages are further discussed below. Declines in abundance and species diversity in the Nepisiguit River were due primarily to heavy metal pollution from mining operations in the late 1960s. A mining related wastewater spill occurred upstream of the Station and resulted in the reduction of the Atlantic salmon population to critical levels (Lutzac 1983). This event was followed by restrictions imposed on commercial salmon fishing and angling, as well as various stocking efforts that facilitated the slow recovery observed in the late 1980s (Baker, R., pers. comm., 2021). While the wastewater spill was thought to have affected other aquatic species than Atlantic salmon, these impacts are poorly documented.

Nepisiguit Falls itself is impassable to diadromous fish (i.e., fish that migrate between freshwater and marine environments) because of its approximate 30 m drop in elevation, and, therefore, fish assemblages are vastly different when comparing reaches above (upstream) and below (downstream) of the Station. The lower reach of the watershed provides habitat for the majority of aquatic species in the system, including those of high value to the Pabineau First Nation. These high value species include Atlantic salmon, American eel, and brook trout (Kryszko, R., pers. comm., 2021).

Fish Habitat

Potential for fish habitat within the LAA is dependent solely on conditions upstream of the Station. Fish movements, including those of anadromous fish (i.e., fish spawning in freshwater but living in marine environments as part of their life stages, such as Atlantic salmon), catadromous fish (i.e., fish spawning in marine environments but living in freshwater as part of their life stages, such as American eel), and fish that move between marine water and freshwater (i.e., diadromous fish) or travel within a watercourse cannot pass Nepisiguit Falls and thus will not be able to access the upper portion of the LAA above the dam.

The Nepisiguit River's morphology immediately upstream of the Station consists primarily of an impoundment, above which is a large set of rapids approximately 7 km upstream. Immediately downstream of the Station, the turbulent tail-water (and associated hydraulic jump) rapidly settles into a long sequence of riffles, runs, and pools.

Based on observations made during fish and fish habitat field work conducted in the impoundment between July 6-8, 2021, the Nepisiguit River is a large, permanent watercourse whose impoundment ranges from approximately 110 m to 180 m wide. The surrounding upland area is largely undeveloped and includes former mining and active forestry operations, as well as residential properties limited primarily to the Nepisiguit Falls Road. The Nepisiguit River is confined on both sides by steeply sloping (primarily bedrock) banks which are lined with riparian vegetation dominated by coniferous trees and shrubs on the southern bank, while the northern bank was dominated by deciduous tree species with a dense understory of tall deciduous shrubs. However, as a result of the Nepisiguit River's width within the impoundment, crown closure (i.e., shade provided) is minimal.

Based on observations made during fish and fish habitat field work conducted in the impoundment between July 6-8, 2021, the benthic substrate within the LAA is observed as a mix of exposed bedrock (60%), boulder (10%), rock (5%), rubble (5%), gravel (10%), sand (5%), and fines (5%). Deposits of crushed stone from past bank stabilization associated with construction activities are present on the banks in select locations within the LAA. Settling of sedimentary inputs from upstream of the LAA in the Station are the likely the largest factor in determining streambed composition. Upstream of the Station, substrates are assumed to be bedrock within the set of rapids, changing to a patchy mix of cobble, gravel, sands, and silts within the run area, depending on depth and flow velocity. Downstream of the Station, benthic substrate is again expected to be a patchy mix of cobble, gravel, sands, and silts within the flat and pool area, transitioning to cobble, larger gravels, and some exposed bedrock within the riffle sequence.

Water depths within the impoundment during the July 2021 field program generally ranged from 5.25 m to 8.25 m; however, due to safety concerns these measurements were limited to within 100 m upstream of the safety booms.

Water Quality

Surface water quality was discussed in detail in **Section 5.5.2.3**. In addition to the physical characteristics of the Nepisiguit River, water quality is an important component of fish habitat. The NBDELG operates a water quality analysis monitoring station at the Middle Landing, approximately 12 km downstream of the Station that measures a wide variety of physical and chemical water quality parameters. The monitoring station is sampled a minimum of four times per year to collect data including temperature, dissolved oxygen (DO), pH, conductivity, and turbidity (NBDELG 2021e). The measured ranges of physical water quality parameters between October 13, 2020 and July 20, 2021 were as follows: temperature 9.5 to 21.5°C, DO between 10.5 and 6.1 mg/L, pH of 7.6 to 7.7, conductivity 48 to 51 µS/cm, and turbidity 0.5 to 0.7 NTU (NBDELG 2021e).

The mean water temperatures between June and July 2021 were above 20°C, which is considered to be warm in relation to fish habitat (MacMillan et al. 2005). For example, some species of fish including salmonids require cool water temperatures (< 16.5°C) to survive (MacMillan et al. 2005). The minimum DO values throughout 2021 were above the CWQG FWAL DO requirement for early life stages of warm water biota (6 mg/L); however, the minimum DO values fell below the CWQG FWAL

DO requirement of early life stages of cool water biota (9.5 mg/L) in the months of June and July 2021. The warm temperatures and low DO values in summer months are likely impacted by the warming of the slow-moving water in the upper strata of the Station's impoundment. The mean pH values were within the CWQG FWAL acceptable range of 6.5 to 9.0 throughout 2021. The temperature, DO, and pH values recorded in the Middle Landing Station in 2021 suggest a hospitable environment for salmonid species in the primary channel of the Nepisiguit River during most of the year.

Two surface water samples were collected in the impoundment during the fish and fish habitat field program in July 2021. The results of such water quality sampling were discussed in **Section 5.5.2.3**, and are not repeated here for brevity.

Fish Species Assemblages

A number of both native and non-native freshwater and diadromous (i.e., anadromous and catadromous) fish species are known to be found in the Nepisiguit River. The most common native freshwater species generally include brook trout, American eel, striped bass (*Morone saxatilis*), alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), and Atlantic salmon (Baker, R., pers. comm., 2021).

Fish species known to occur within the Nepisiguit River both upstream and downstream of the Station are described in **Table 5.6.1** (for non-SAR/SOCC) and **Table 5.6.2** (for SAR/SOCC) below (AC CDC 2021). Further discussion on the fish assemblages and populations within the LAA is provided below.

Table 5.6.1: Summary of Non-SAR/SOCC Aquatic Species Potentially Present in the Nepisiguit River

Species	Status[1]	Species Description	Potential to Occur in Project Site
American shad (*Alosa sapidissima*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank :** S5	The American shad is an anadromous fish closely related to gaspereau (see below). The spawning migration of eastern Canada typically occurs between late April and late June (DFO 1990). Spawning occurs at night, usually in deep areas of a river with a moderate to strong current. American shad males usually reach spawning age at around four years, while females reach maturity around 5 years. American shad are repeat spawners and among Canadian populations may spawn up to seven times and live to be approximately 13 years old (DF0 1990). Adults return to sea after spawning, while newly hatched young-of-the-year will spend their first summer in freshwater before moving out to sea when river temperatures drop below 15°C (DFO 1990).	Known to occur downstream of the Project site/LAA only.

Species	Status[1]	Species Description	Potential to Occur in Project Site
Blacknose dace (*Rhinichthys atratulus*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	This common minnow species typically inhabits small fast moving gravel bottomed streams, but is also known to survive in slow moving or stagnant waters. Blacknose dace may serve as an important forage species for larger predatory fish (CRI 2021).	Known to occur in the LAA.
Brook trout (*Salvelinus fontinalis*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S4	This species, also known as speckled trout, is native to many areas of eastern North America, but has also been introduced throughout the world due to its popularity as a sportfish. Brook trout prefer cool, clear waters with plenty of cover and make use of nearly anything that will provide them with hiding places. Sea-run brook trout in New Brunswick spawn during October and November in shallow, gravelly areas of streams with clean bottoms and good water flow (Page and Burr 1991).	Known to occur in the LAA.
Common shiner (*Luxilus cornutus*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	The common shiner is an abundant minnow species that primarily inhabits Maritime streams, but it is also found in lakes with weeds and grave/rubble bottoms (DFO 2018).	Known to occur in the LAA.
Gaspereau (*Alosa spp.*): Alewife (*Alosa pseudoharengus*) and Blueback herring (*Alosa aestivalis*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	Alewives and blueback herring are anadromous fish that, in the Maritimes, are collectively referred to as "gaspereau" or sometimes "river herring". These fish are abundant to Maritime watercourses, entering the majority of streams and rivers in the Maritimes. Generally, blueback herring occur in fewer rivers and are typically less abundant than alewives where they co-exist (DFO 2001). The spawning migrations of alewives typically begin approximately two weeks earlier than blueback herring, in late April and is generally completed by late June or early July (DFO 2001). In the Maritimes, both species will typically reach spawning age around three years. Gaspereau are repeat spawners, usually spawning three to five times during their lifespan (Page and Burr 1991). Both species will return to sea shortly after spawning and from August to October the newly hatched	Known to occur downstream of the Project site/LAA only.

Species	Status[1]	Species Description	Potential to Occur in Project Site
		young-of-the-year will migrate downstream, gathering in large schools to live in estuaries and surrounding coastal areas, while adults over-winter at sea (Page and Burr 1991).	
Creek Chub (*Semotilus atromaculatus*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	The creek chub is a common minnow species found in most Maritime freshwater rivers, lakes and streams. This species inhabits small streams and can be found near to the shore in lakes. The creek chub can be differentiated from species that are similar in appearance by a black spot at the base of the dorsal fin, at its anterior margin (DFO 2018).	Known to occur in the LAA.
Rainbow Smelt (*Osmerus mordax*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	Rainbow smelt are anadromous schooling species found in rivers and along coastal areas of North America. They grow and mature in shallow coastal waters and migrate up freshwater streams to spawn (Page and Burr 1991). Landlocked species swim up tributaries during spawning or spawn along the shoreline of a lake. Spawning occurs between February and June at night in fast moving water between 4°C and 10°C (Page and Burr 1991). Eggs laid are sticky and attach to the bottom of the stream. Once hatched, fry float downstream to brackish water, using water depth as cover and feeding on plankton near the surface during the night (Page and Burr 1991). In the first year, smelt grow rapidly, increasing their tolerance for salt water as they get older. They also begin eating larger invertebrates and fish while staying close to shore and seeking cover in eelgrass beds or mud (Page and Burr 1991).	Known to occur downstream of the Project site/LAA only.
Sea lamprey (*Petromyzon marinus*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	Sea lamprey are an anadromous parasitic species native to the Atlantic Ocean and occur along the North American coast. This species resembles the American eel in shape, but lacks paired fins and has a cartilaginous skeleton with no jaw. Instead of a jaw, the adult sea lamprey attach to host fish with a circular, sucker-like mouth lined with rasping teeth which allows them to feed on the blood and	Known to occur downstream of the Project site/LAA only.

Species	Status[1]	Species Description	Potential to Occur in Project Site
		body fluids of their prey. In eastern Canada spawning runs likely occur from late May and through early summer, with peak spawning occurring when water temperatures reach 17°C to 19°C (Kircheis 2004). Adult sea lampreys build and lay their eggs crescent-shaped nests in gravel substrates and die shortly after spawning (Kircheis 2004). Eggs will hatch in 10 to 13 days later and metamorphose into "ammocoetes" which will drift downstream and burrow into the muddy substrates where they will filter-feed on planktonic drift for 4 to 8 years (Kircheis 2004). Eventually, they will emerge from their burrow and metamorphose into "transformers", their migration life stage similar to their final adult form (Kircheis 2004). These 'transformers' will migrate out to sea to become adults and begin their hematophagus method of feeding, returning to freshwater to spawn in 1.5 to 2 years (Kircheis 2004).	
White sucker (*Catostomus commersonii*)	**COSEWIC:** Unlisted **SARA:** Unlisted **NB SARA**: Unlisted **S-Rank:** S5	The white sucker is one of the most common freshwater fish in the Maritimes, occurring in practically all freshwater bodies (Gilhen 1974). This species is a bottom-feeder, spending most of its time hugging the bottom in shallow waters filter feeding in sandy or muddy substrates. White suckers spawn during the spring, typically migrating from lakes up into streams, laying their eggs in shallow areas with a gravelled bottom (Gilhen 1974).	Known to occur in the LAA.

Notes:
[1] AC CDC S-Ranks as follows: S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community; SNA: Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (AC CDC 2021)

Table 5.6.2: Summary of SAR/SOCC Aquatic Species Potentially Present in the Nepisiguit River

Species	Status[1]	Species Description	Potential to Occur in Project site
American eel (*Anguilla rostrata*)	**COSEWIC:** Threatened **SARA:** Unlisted **NB SARA**: Threatened **S-Rank:** S4	The American eel is a catadromous species, spending most of its life in freshwater and returning to salt water to spawn. Spawning migration can occur anytime between August and December, but peak migration typically occurs between the months of September to October (Page and Burr 1991). During migration, American eels undertake long oceanic migrations to the Sargasso Sea to spawn (Page and Burr 1991). Their buoyant eggs will typically hatch within one week, hatch and develop into larvae which drift passively with ocean currents of the Gulf Stream to the coastal areas of North America. These larvae will metamorphose into 'glass eels' (juveniles) which are attracted to freshwater, actively migrating into brackish estuaries and developing into "elvers" (COSEWIC 2012a). They may remain in the estuaries for up to a year, moving up and down with the tides as they adapt to living in freshwater. Once "elvers" have completed their migration into freshwater they become "yellow eels", marked by a significant growth phase where their skins thickens and sexual differentiation occurs (COSEWIC 2012a). Between eight and 23 years of growth in freshwater are required for "yellow eels" to become "silver eels", at which time they will begin their spawning migration back to the Sargasso Sea (COSEWIC 2012a).	Known to occur in the LAA (Baker, R., pers. comm., 2021).
Atlantic salmon– Gaspé–Southern Gulf of St. Lawrence Population (*Salmo salar*)	**COSEWIC:** Special Concern **SARA:** Unlisted **NB SARA**: Special Concern **S-Rank:** S2S3	Atlantic salmon are an anadromous species, spending part of their life feeding and growing during long migrations at sea and then returning to reproduce in their natal streams. Atlantic salmon spawning runs typically begin moving up river from spring through into the fall. Peak spawning typically occurs from October to November and eggs are laid in constructed "redds" built in gravel beds near the head of riffles, or the tail of a pool (Page and Burr 1991). Young salmon (smolts) usually	Known to occur downstream of the Project site/LAA only.

Species	Status[1]	Species Description	Potential to Occur in Project site
		live in shallow riffle areas approximately 25 cm deep with gravel, rubble, rock or boulder substrates. Adult salmon that have spawned will usually immediately return to sea before winter, but occasionally will overwinter in freshwater until spring (Page and Burr 1991). The size of the Gaspé–Southern Gulf of St. Lawrence Atlantic Salmon population is approximately 100,000 individuals. These salmon are spread amongst 78 rivers across 4 provinces (Québec, PEI, Nova Scotia, New Brunswick), however more than 50% of the total population returns to the Miramichi River system to spawn (COSEWIC 2010). This population of Atlantic salmon is known to occur and spawn in the Nepisiguit River system.	
Striped Bass Southern Gulf of St. Lawrence Population (*Marone Saxatilus*)	**COSEWIC:** Special Concern **SARA: Unlisted** **NB SARA**: Unlisted **S-Rank:** S3	The Southern Gulf of St. Lawrence striped bass population occurs in the southern Gulf of St. Lawrence, primarily on the east coast of New Brunswick, but also part of the coast of Nova Scotia, Prince Edward Island, and eastern Québec (Chaleur Bay and Gaspé). This population of striped bass is listed as Special Concern, it has been steadily increasing in numbers since its listing as Threatened in 2004 (COSEWIC 2012b). The striped bass is anadromous, spawning in freshwater when spring water temperatures reach 10°C and extends until water temperature reaches 19°C (typically May and June).	Known to occur downstream of the Project site/LAA only.

Notes:
[1] AC CDC S-Ranks as follows: S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community; SNA: Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (AC CDC 2021).

A custom report was obtained from AC CDC for the area within 100 km radius of the Station, as there were not enough data to generate a comprehensive catalogue of species within a 5 km radius. Therefore, aquatic species listed below excludes marine species (as this area extends into the Gulf of St. Lawrence), as well as species that have been observed outside of a 5 km radius, but have not been encountered in the collection of local knowledge.

Atlantic salmon is by far the most studied of all of the valued aquatic species on the Nepisiguit River. The Pabineau First Nation and the Nepisiguit Salmon Association both have a deep interest in the conservation of this species, and conduct yearly population surveys on this species at all stages of development.

An Atlantic salmon counting fence operated by the Pabineau First Nation (approximately 25 km downstream of the Station) is generally operated from June to October each year, coinciding with the migration periods for peak salmon migration. Counts have been conducted yearly since 1981 (Kryszko, R., pers. comm., 2021). Fish counts from the Pabineau First Nation from 2018-2020 (the latest year for which data are available) are included below in **Table 5.6.3** and **Table 5.6.4**.

Table 5.6.3: Pabineau Counting Fence Atlantic Salmon Catch Results, 2018-2020

Year	Fish Caught[1] (number of fish)	
	Grilse	Adult Salmon
2018	13	4
2019	116	73
2020	229	113

Source: Kryszko, R., pers. comm., 2021

Notes:

Counting fence data values from 2018 were reported as abnormally low due to warm water conditions.

Table 5.6.4: Atlantic Salmon Electrofishing Results in the Main-Stem of the Nepisiguit River, 2016-2020

Year	Fish Caught[2] (Density per 100 m^2)	
	Fry	Parr
2018	11.8	0.69
2019	9.0	1.16
2020	4.3	2.37

Source: Kryszko, R., pers. comm., 2021.

Fish assemblage data in the impoundment were collected as part of the fish and fish habitat field program between July 6-8, 2021. The results are being compiled and will be documented in a separate technical report to be provided to the Technical Review Committee (TRC) in parallel to their

[1] The term, "grilse" refers to a size class of adult Atlantic salmon that return to spawn after only one winter at sea (usually referred to as a "sea winter"). These fish are usually less than 63 cm in length and are most often males. The term "salmon" refers to a size class of adult salmon that are generally greater than 63 cm and have likely spent two or more winters at sea before returning to spawn.
[2] "Fry" are typically young of the year fish, and "parr" are the next size class up before they turn silver and return to sea (after which they are referred to as "smolt").

review of this EIA Registration document. However, in general, the most frequently species captured (in order of prevalence) included the creek chub, white sucker, and blacknose dace.

5.6.3 Assessment of Potential Interactions between the Project and Fish and Fish Habitat

The Project has the potential to affect fish and fish habitat through various phases and activities of the Project through changes in hydrology, geomorphology, water quality and quantity, sedimentation, as well as ecosystem and species biodiversity as outlined below.

5.6.3.1 Potential Interactions

The following potential interactions are based on the current understanding and objectives of the Project as described in **Section 2.3**.

Potential Temporary Interactions During Construction of the Project Phases

- Change in sediment concentrations, in potential contaminant concentration, and in general water quality through the potential entry or release of deleterious substances through forebay bridge replacement/repair, disruption of accumulated sediment in the impoundment, accidental spill events, machines in the watercourse and/or their buffer, and refuelling in/near water (refer to **Section 7.0**, Accidents, Malfunctions, and Unplanned Events);
- Temporary loss of fish habitat in the impoundment during dewatering activities (i.e., loss of wetted area/wetted perimeter of the watercourse), which will be regained once water levels are again raised;
- Temporary loss of fish habitat in the impoundment due to the construction and presence of cofferdams used to isolate the work area for the sluiceway bladder replacement and forebay bladder replacement so that those activities can be carried out "in the dry", which will be regained following those bladder replacements when the cofferdams are removed;
- Fish injury and/or mortality from displacement or stranding of fish during refurbishment activities (i.e., dewatering of work areas) and through the change in water flow and quantity (as a result of the deflation of rubber bladders); and
- Potential increases in water temperature and associated decreases in dissolved oxygen due to the reduction of impoundment water volume as a result of dewatering activities.

Potential Permanent Interactions During Subsequent Operation of the Station

- The replacement of the existing turbines with new DIVE-HAX-Turbines is expected to yield permanent interactions as a result of their ability to increase the throughput of water during periods of high river flow, reducing or eliminating the need to discard excess water through the existing spillway or sluiceway. This increase in nameplate production capacity of approximately 22% compared to currently could also result in an overall increase in flow through the turbines as high as 22% on an annualized basis, and therefore could conceivably increase fish entrainment as a result.

5.6.3.2 Mitigation

In addition to the mitigation measures that were defined in **Section 5.5.3.2** for the surface water VC, the following standard mitigation measures have been identified to reduce the likelihood of occurrence, or minimize potential extent of effects of the Project on fish and fish habitat. Planned standard mitigation measures for the proposed Project include the following:

- Consultation with DFO throughout the Project to ensure compliance with regulatory requirements and guidelines;
- The area to be disturbed by the Project (including the footprint of the cofferdams) will be minimized to the extent possible to only that area which is required to accomplish the Project objectives;
- Dewatering of the impoundment will be carried out in a controlled manner to avoid undue injury or mortality to fish, the mobilization of impounded sediment, and downstream erosion due to potential for increased water velocities during dewatering;
- Water levels in the impoundment will be lowered only to the extent required to accomplish the construction of the cofferdams, and the duration of lowered water levels will be minimized to the extent possible;
- NB Power will obtain a watercourse and wetland alteration (WAWA) permit for Project activities carried out within the Nepisiguit River itself as well as within 30 m of the river, and the Project activities will comply with the conditions of the WAWA permit;
- Should DFO determine that the temporary loss of fish habitat associated with temporary dewatering of the impoundment or the temporary presence of cofferdams constitutes a harmful alteration, disruption, or destruction (HADD) of fish habitat, NB Power will apply for and obtain an authorization under Section 35(2) of the *Fisheries Act*, with sufficient offsetting as determined by DFO;
- A fish rescue program will be implemented prior to dewatering the work areas within the cofferdams, once constructed, and fish will be removed and relocated as per DFO guidance, permits, and consultation;
- Appropriate erosion and sediment control (ESC) measures will be incorporated for the Project phases and will be checked regularly and prior to and after storm events to ensure they are continuing to operate properly to prevent the undue release of suspended sediments into water as a result of the refurbishment activities and minimize potential effects to fish and fish habitat;
- Efforts will be made to ensure that as little construction material (e.g., concrete debris) falls into the Nepisiguit River as possible, and any such materials that fall into the Nepisiguit River will be subsequently removed as quickly as possible;
- Emergency spill kits will be maintained on-site and all staff will be trained on how to use them; and

- A Project-specific Environmental Management Plan (PSEMP) will be developed prior to the start of the Project and will provide details on proper ESC measures, waste management, contingency measures, heavy equipment operations and maintenance, and an Emergency Response Plan (ERP) or processes for accidental spills, emergencies, incidents or storm events.

5.6.3.3 Characterization of Potential Interactions Following Mitigation

The Project will result in the above-mentioned interactions (**Section 5.6.3.1**) with fish and fish habitat and related aquatic species; however, the mitigation measures above in **Section 5.6.3.2** will be implemented to minimize negative interactions to the extent possible.

The changes that are anticipated for water depth/flow, wetted area, water and sediment quality, and timing of the phases and activities of the Project are not expected to substantially affect fish and fish habitat, and in particular SAR/SOCC. This is because environmental effects will be short in duration (i.e., until the system equilibrates to current flow conditions), and will be similar in nature or slightly exceeding current fluctuations (i.e., natural water level fluctuations and operational drawdown of the Station's impoundment).

As noted above, the wetted area upstream of the Station is subject to water level drawdown during dewatering activities, resulting in a temporary loss of fish habitat due to the loss of wetted area arising from dewatering. Given that there is little sediment accumulated in the impoundment and water level changes are temporary and not expected to be substantive, there are no expected conditions that would lead to the impairment of water or sediment quality on a long-term basis with respect to the CCME guidelines. Additionally, dewatering activities within the impoundment will be carried out during low flow conditions to the extent possible, and the drawdown rate will be carefully controlled to avoid fish stranding in riparian areas, mobilization of impounded sediment, or downstream erosion.

It is unclear if this temporary loss of fish habitat (wetted area) will be considered by DFO to be a HADD that requires authorization under the *Fisheries Act*; consultation with DFO is required in this regard. Water levels in the impoundment will be lowered in a controlled fashion and only to the extent required to accomplish the construction of the cofferdams, and the duration of lowered water levels will be minimized to the extent possible. Should DFO determine that an authorization is required for this temporary loss or for a temporary loss of wetted area, NB Power will apply for such authorization and develop an appropriate offsetting strategy to offset the loss of fish habitat arising from those activities. Periodic water quality monitoring during Project activities will be conducted.

The construction and presence of cofferdams in the impoundment to isolate the work area for the sluiceway bladder replacement and forebay bladder replacement will result in the temporary loss of fish habitat area underneath those cofferdams while they are in use (i.e., a temporary loss of fish habitat underneath the footprint of the cofferdams). The footprint of the cofferdam for the sluiceway bladder replacement is estimated at approximately 3,600 m^2, and the footprint for the sluiceway bladder is estimated at approximately 1,100 m^2. Both cofferdams may constitute a temporary alteration of fish habitat while the cofferdams are in place, but the fish habitat will be restored once the cofferdams are removed.

It is unclear if this temporary loss of fish habitat due to the presence of the cofferdams will be considered by DFO to be a HADD that requires authorization under the *Fisheries Act*; consultation with DFO is required in this regard. This temporary loss of fish habitat will be reversed with the removal of those cofferdams once the bladder replacement activities are complete. Should DFO determine that an authorization is required for this temporary loss of fish habitat due to the presence of cofferdams, NB Power will apply for such authorization and develop an appropriate offsetting strategy to offset the loss of fish habitat arising from those activities.

Impounded fish within the isolated area within the cofferdams will be rescued prior to dewatering the isolated area in order to avoid stranding or mortality of fish. DFO guidelines will be followed for any handling of fish in addition to scheduling of the life extension activities to ensure to ensure fish mortality is minimized. Additionally, communication will be maintained with DFO throughout the Project.

5.6.4 Summary

In light of the above, the Project, will interact with fish and fish habitat primarily through temporary means (i.e., temporary change in water elevations, temporary fish passage obstruction, etc.) during the Project activities, as well as permanent means (i.e., increased water flow through the turbines on an annualized basis). There are no foreseeable features of the Project that would result in accidents, malfunctions, or unplanned events (refer to **Section 7.0**) that would lead to a significant environmental impact on fish and fish habitat. Negative interactions such as fish injury and alteration of fish habitat will be minimized through the use of mitigation measures for each phase/activity of the Project as necessary, and effects to fish and fish habitat will thus be minimized and are not considered substantial.

In light of the above, and in consideration of planned mitigation and best practices aimed at reducing environmental effects, the potential interactions between the Project and on fish habitat and fish are not expected to be substantive. The results of field surveys including fish presence/absence surveys, fish habitat assessments and water quality sampling will confirm the results of the desktop evaluation (in a separate supplemental report) to increase the level of confidence of this prediction.

5.7 Vegetation and Wetlands

The potential interactions between the Project and vegetation and wetlands, including vegetation species at risk, are assessed in this section.

5.7.1 Scope of VC

Wetlands are defined as land where the water table is at, near, or above the land's surface, or land which is saturated for a long enough period to promote wetland or aquatic processes as indicated by hydric soils, hydrophytic vegetation, and various kinds of biological activities adapted to the wet environment (NBDNRE-NBDELG 2002; NTNB 2018).

Vegetation includes terrestrial and aquatic plant species (both vascular and non-vascular, such as mosses) as well as lichens.

Vegetation and wetlands was selected as a valued component (VC) because they are valued in their relationship with water resources, wildlife and wildlife habitat, and other biological and physical components addressed as VCs in this EIA Registration. In addition, species at risk (including plants) are protected under federal and provincial legislation (pursuant to the federal *Species at Risk Act* [SARA] and the New Brunswick *Species at Risk Act* [NB SARA]), and species at risk and other rare plant species are considered valued—including species of conservation concern as identified as “extremely rare” (S1), “rare” (S2) or “uncommon” (S3) if they are present (AC CDC 2021).

In this EIA Registration document, we define “species at risk” (SAR) as those species that are listed as “Extirpated”, “Endangered”, “Threatened”, or “Special Concern” on Schedule 1 of the federal *Species at Risk Act* (SARA) or the New Brunswick *Species at Risk Act* (NB SARA). We also define “species of conservation concern” (SOCC) as those species that are not SAR but are listed in other parts of SARA, NB SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of “extremely rare” [S1], “rare” [S2] or “uncommon” [S3]).

New Brunswick’s wetlands have been given specific protection pursuant to the New Brunswick *Clean Environment Act* and the *Clean Water Act*. The New Brunswick Department of Environment and Local Government (NBDELG) requires a permit for any alteration within 30 m of the banks of a watercourse or the delineated boundaries of a wetland. Wetlands often support rare or uncommon vegetation species assemblages, and the New Brunswick Wetlands Conservation Policy and regulatory processes are guided towards the goal of achieving no net loss of wetland function (NBDNRE-NBDELG 2002). Also, wetlands are widely recognized as providing a host of ecosystem functions and benefits including, but not limited to filtering out pollutants and heavy metals, mitigating flood events, and providing habitat to many SAR in New Brunswick such as the wood turtle (*Glyptemys insculpta*), least bittern (*Ixobrychus exilis*), and showy lady's-slipper (*Cypripedium reginae*), among others (NTNB 2018). Wetland compensation for alterations of a delineated wetland is often required as a condition of a watercourse and wetland alteration (WAWA) permit when a “net loss of wetland function” occurs, usually at a ratio of two units of wetland to be restored for every one unit of wetland altered.

This VC covers the vegetation component of terrestrial and aquatic habitats, as well as wetlands including their habitat functions. It does not cover the wildlife (including wildlife SAR) that may be using the habitats, which is addressed in **Section 5.8** (wildlife and wildlife habitat), nor does it address aquatic wildlife (including fish and aquatic SAR) which is addressed in **Section 5.6** (fish and fish habitat).

The local assessment area (LAA) for vegetation and wetlands is defined as the riparian area approximately 500 m upstream and 500 m downstream of the Station, within 30 m of the Nepisiguit River.

5.7.2 Existing Conditions

The information regarding the presence and characterization of wetlands and the characterization of vegetation communities within the Project site and surrounding area was derived from several sources including existing databases and secondary information sources (i.e., desktop analysis). This desktop analysis is supplemented by a site-specific field evaluation of the Project site completed on various occasions during the spring and summer of 2021, and as will be documented in a separate technical report (currently under preparation) that will be provided as supplemental information to the Technical Review Committee (TRC) in parallel to the review of this EIA Registration document.

Following a brief regional setting below, the methods used during the desktop analysis and field surveys, followed by the results of these analyses and surveys, are presented in the following sections.

5.7.2.1 Regional Setting

The Project site is located within the Northern Uplands ecoregion and, more specifically, within the Tjigog ecodistrict, which sits on an undulating plateau that extends from the North Charlo River down to the Nepisiguit River. North-easterly flowing watercourses along bedrock faulting characterize this area (Zelazny 2007).

The ecodistrict is a transitional area between the higher elevations of the Tetagouche ecodistrict to the southwest and the Nicolas-Denys ecodistrict to the northeast, with elevations ranging from 300 m to 100 m above mean sea level (m amsl). Compact, medium-textured soils, originally from metasedimentary and igneous rocks, dominate the southern reach along the Nepisiguit River (Zelazny 2007). Within this ecoregion, tolerant hardwood stands dominated by American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*) on well-buffered soils and along lower elevations. On the more inland and higher elevations, coniferous trees become more prevalent, especially balsam fir (*Abies balsamea*), black spruce (*Picea marianan*) and white spruce (*Picea glauca*), red pine (*Pinus resinosa*), and white pine (*Pinus strobus*). In the river valleys of this region, trembling aspens (*Populus tremuloides*) are particularly common (Zelazny 2007).

5.7.2.2 Desktop Analysis

<u>Desktop Analysis Methods</u>

Dillon reviewed readily-available information from reputable sources. The information was reviewed to evaluate the potential for vegetation SOCC and/or vegetation SAR within the general area of the Project and to assist in scoping/focussing efforts for the field surveys that were conducted in the spring (June 9) and summer (July 6 and 7) of 2021. Dillon completed a review of the following sources and data lists for the purpose of characterizing existing conditions for this EIA Registration document:

- A custom AC CDC report (AC CDC 2021; refer to **Appendix A**);
- New Brunswick Department of Natural Resources and Energy Development (NBDNRED) and NBDELG publications;
- The federal SAR registry;

- The provincial SAR registry;
- Publicly-available Geographic Information Systems (GIS) map layers and databases;
- High resolution aerial photography; and
- GeoNB wetland and watercourse mapping.

The information obtained from this desktop analysis was supplemented by a field survey conducted by biologists from Boreal (acting as a subconsultant to Dillon) on various occasions during the spring and summer of 2021, to characterize site-specific environmental conditions for vegetation and wetlands near the Station. The results of these field surveys are briefly summarized below in **Section 5.7.2.3**, with additional detail in a separate technical report to be provided to the TRC in parallel to their review of this EIA Registration document.

Desktop Analysis Results – Wetlands

Based on a desktop analysis, there are no identified wetlands within the Project site or the surrounding area within 500 m upstream or 500 m downstream of the Project site. This was confirmed in the June 2021 field surveys conducted by Boreal's terrestrial ecologist who is a professional certified in wetland delineation and functional assessments in New Brunswick.

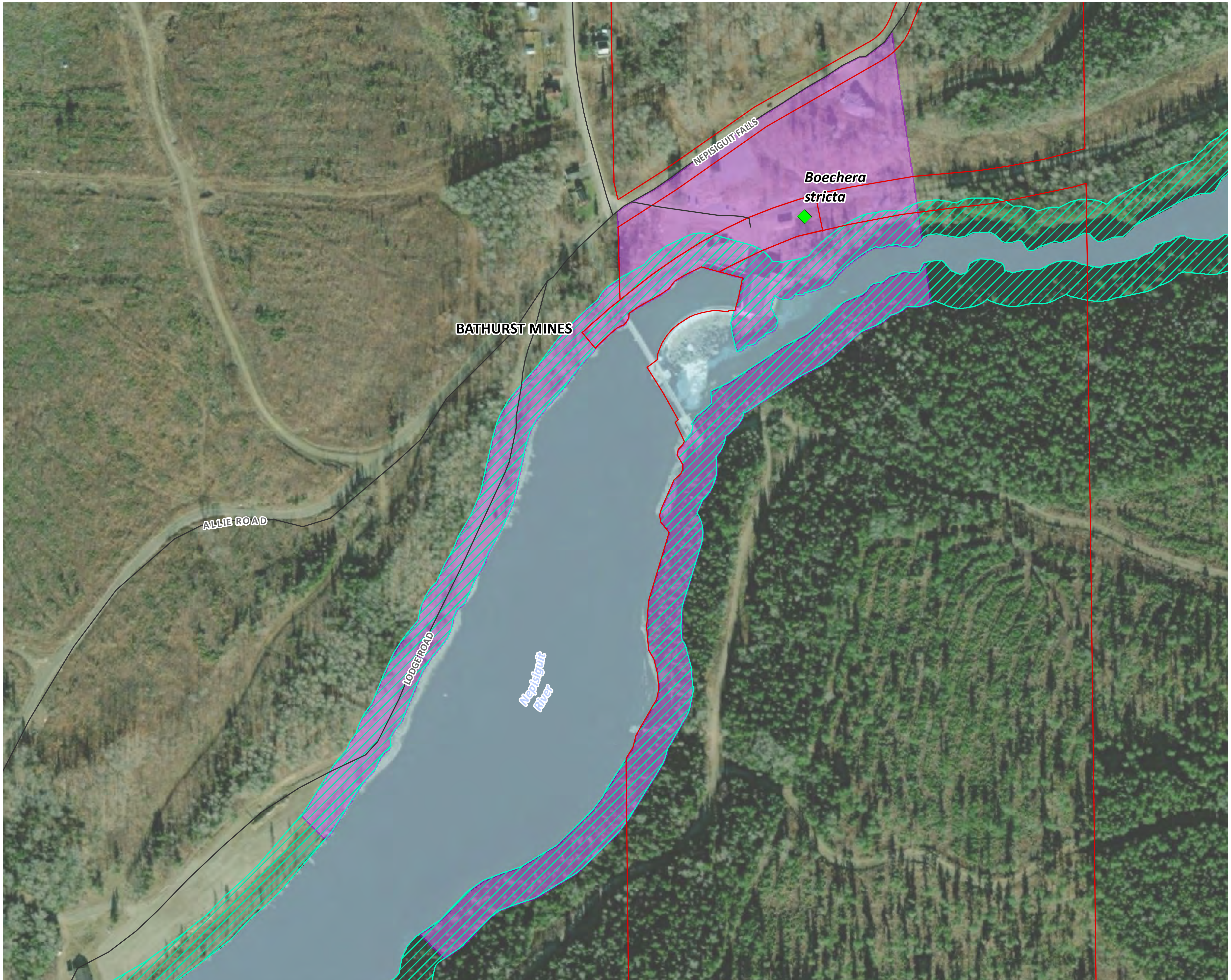
As such, wetlands will not be discussed further in the remainder of this EIA Registration document.

Desktop Analysis Results – Vegetation Communities

Based on a desktop analysis, the land within and around the Project site is predominately forested, with the powerhouse building, dam, bridges, and access roads being the only development in the immediate area near the Station. The forest on the south side of the Nepisiguit River near or on the Project site is composed of primarily mature softwoods, including black and white spruce with some eastern white pine, as well as some tolerant hardwoods such as birch and aspen. The wooded areas on the north side of the Nepisiguit River near or on the Project site are made up of primarily immature hardwoods and shrubs with some older softwoods, such as pine, that were left during the last harvesting operations. There are also residential houses beginning approximately 150 m north of the Station on Nepisiguit Falls Road. The residential properties are expected to contain ornamental tree, shrub, and herbaceous species. Both upstream and downstream riparian zones consist of steep slopes and include hardwood dominated wooded areas with primarily rocky shorelines.

A custom AC CDC report was obtained for a 5 km radius around the Project site (AC CDC 2021). The report lists historical observations of species of flora and fauna, including rare species, SOCC (i.e., species with S-ranks of S1, S2, or S3), and SAR within a 5 km radius from the Project site (refer to **Appendix A**). The AC CDC report (AC CDC 2021) included one historical record of a vascular plant SAR with a Threatened status under COSEWIC: black ash (*Fraxinus nigra*). The AC CDC report also included historical records of 14 other vascular plant SOCC historically observed within a 5 km radius of the Project site. Of these, one SOCC, Drummond's rockcress (*Boechera stricta*), was historically recorded within the boundaries of the Project site (AC CDC 2021) (refer to **Figure 5.7.1** and **Figure 5.7.2**). There were no historical records of observations of vegetation SAR species on the Station property or immediately nearby.

[This page was intentionally left blank]



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

LOCAL ASSESSMENT AREA (LAA) FOR VEGETATION AND WETLANDS

FIGURE 5.7.1

- Species at Risk / Species of Conservation Concern - Vegetation
- Road
- NB Power Property
- 30 m Waterbody Buffer
- Local Assessment Area
- Waterbody

0 25 50 100 meters

SCALE 1:3,300

N S E W

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB, ACCDC

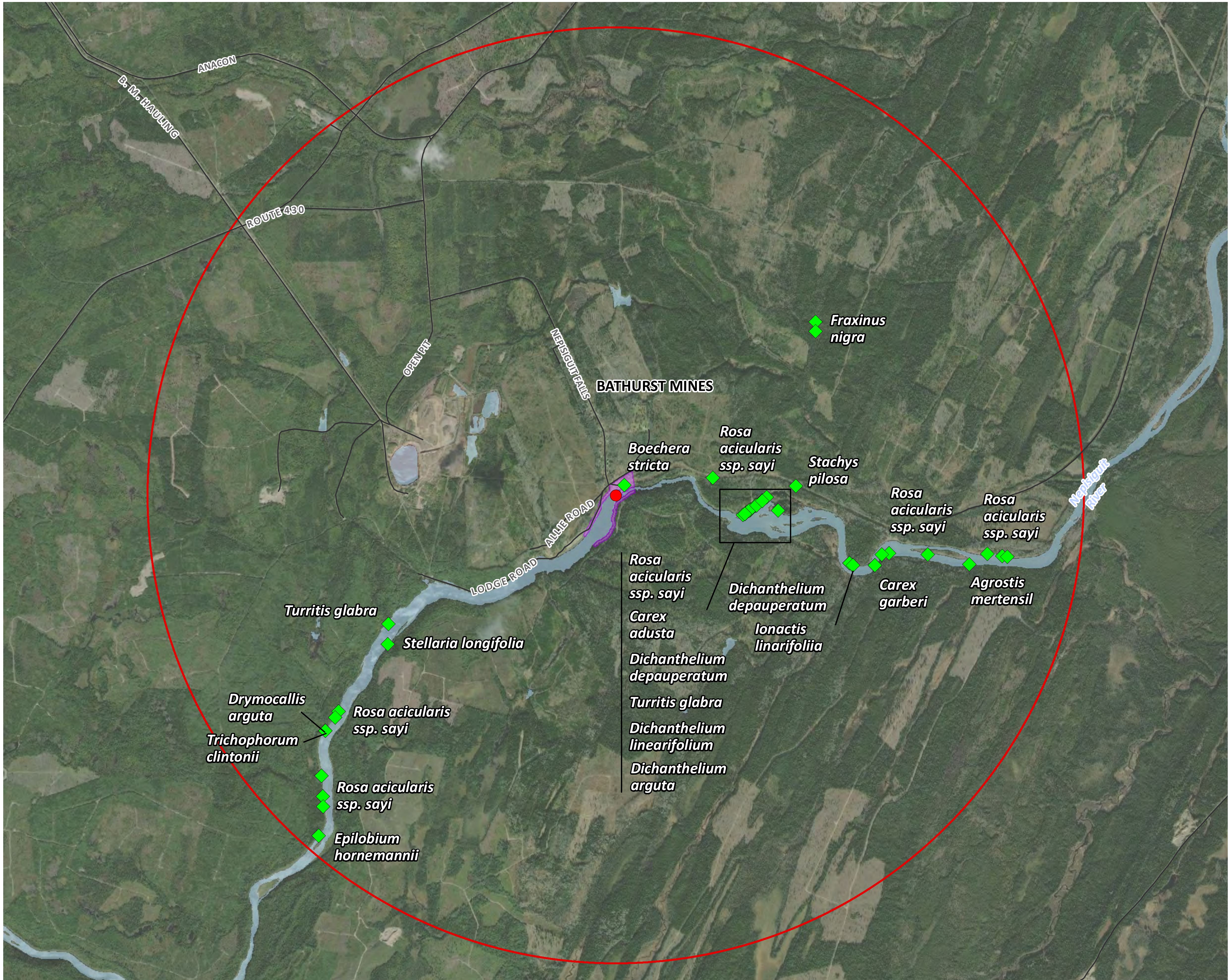
MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-09-14



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

HISTORICAL RECORDS OF VEGETATION SAR/SOCC WITHIN 5 KM OF THE STATION

FIGURE 5.7.2

Project Location

Vegetation Species at Risk / Species of Conservation Concern

Road

Project Location 5 km Radius

Local Assessment Area

Waterbody

0 330 660 1,320 meters

SCALE 1:40,000

N S W E

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB, ACCDC

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641
STATUS: DRAFT
DATE: 2021-09-21

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F572_HistoricalRecordsVegetation.mxd

Desktop Analysis Results – Priority Plants

Based on the desktop analysis, a conservative assessment was made on the potential for priority flora species and their habitats as documented by available information from secondary sources, which includes the AC CDC (2021) report. In the planning for the field surveys, it was conservatively assumed that all priority flora species identified by the AC CDC as having been historically observed within 5 km of the Station may be present where potential habitat exists within the surrounding area.

For this EIA Registration document, the typical habitat of each SAR or SOCC was identified and compared to the habitats identified within the surrounding area. Each SAR or SOCC was evaluated for the potential for occurrence within the Project Site as "Known", "Probable", "Possible", and "Unlikely". Of the 15 species identified as priority species (i.e., one SAR and 14 SOCC), only one species has a known occurrence within the immediate area, four were considered to have a probable potential to occur within the Project site, six were considered to possible potential to occur within the Project site, and the remaining four priority species were considered unlikely to occur within the Project site. For each SAR/SOCC, the ranking, status, habitat, and potential to occur within the Project Site is summarized in **Table B.1** in **Appendix B**.

The only SOCC that was identified by the AC CDC records of being historically present within the Project site is as follows (refer to **Figure 5.7.1**):

- **Drummond's rockcress (*Boechera stricta*)** is ranked S2 (rare) by the AC CDC, but is not listed pursuant to SARA, NB SARA, or COSEWIC. This small plant from the mustard family is found in dry sandy or rock outcrops and open woods, often in somewhat disturbed soils (Hinds 2000). It typically flowers from May to June (Munro et al. 2014).

This evaluation of the potential for vascular and non-vascular priority plant species to occur within the Project site was used to guide field planning efforts for the field survey of vegetation communities completed in spring and summer 2021. Rare plant, vegetation, and wetland surveys were conducted concurrently within the Project site and the immediate surroundings during periods that priority species are expected to flower or fruit. Therefore, field surveys were planned to be conducted during the months of June and July to ensure the assessment occurs during the times when SAR/SOCC are flowering or in fruit, for ease in their identification.

5.7.2.3 Field Surveys

Field Survey Methods

Vegetation and wetland surveys of the Project site and the surrounding area were conducted by qualified terrestrial ecologists from Boreal subcontracted by Dillon. The Boreal terrestrial ecologists were accompanied by NB Power's Indigenous field liaison during these surveys. Vegetation and wetland surveys were spread out over the length of the growing season in order to capture the optimal survey periods for various species with differing rates of development. Surveys were conducted on June 9, July 6, and July 7, 2021.

The spatial extent of the vegetation and wetlands field surveys conducted encompassed approximately 3 ha, extending approximately 500 m upstream from the Station, within approximately 30 m of the river on both sides of the water. Additionally, though not subject to this EIA Registration, vegetation and wetland surveys were conducted in the alignment of the new bypass road.

The surveys were conducted both by water (from a boat) and on land on both sides of the Nepisiguit River. Land-based surveys were conducted in a random meandering fashion focusing on unique habitats within and around the Project site including the forebay and impoundment area, while shoreline surveys within the immediate riparian area of the impoundment were largely conducted by scanning the shoreline from a boat. Specimens were collected for species that could not be identified in the field for more in-depth examination and identification. During the surveys, all vascular plant species encountered were recorded and specific location data were recorded for each SOCC and/or SAR location. Information on major plant community types and their extent and location were recorded.

Field Survey Results – Wetlands

A desktop review of provincial wetland mapping indicated that no suspected wetlands were present in the Project site. During the course of fieldwork, no wetlands were encountered within the areas of the Project site surveyed. Wetlands are therefore not discussed further.

Field Survey Results – Vegetation Communities

As will be discussed in further detail in a separate technical report documenting the results of vegetation field surveys for the Project that is being prepared by Boreal, a total of 198 plant species were recorded during the surveys. Of these, 28 species were not native to New Brunswick. There were only two plant SOCC (i.e., cut-leaved anemone and Drummond's rockcress), and no SAR, recorded within and surrounding the Project site (**Table 5.7.1**).

Table 5.7.1: Plant SOCC Found in the Surveyed Area in and around the Project Site

Common Name	Scientific Name	SARA/NB SARA/ COSEWIC Status	AC CDC S Rank
Cut-leaved anemone	*Anemone multifida*	-	S2 (rare)
Drummond's rockcress	*Boechera stricta*	-	S2 (rare)

Drummond's rockcress is ranked as S2 (rare) by the AC CDC as it is only found in a small number of locations in the province and is therefore considered rare. Its provincial distribution is scattered, with occurrences across the province, typically occurring on rocky shorelines of larger rivers and waterbodies, but occasionally occurring away from water. There were 32 individual Drummond's rockcress plants found in the surveyed area, primarily along the banks of the Nepisiguit River. The locations near the water suggests that this population may disseminate seed by way of water and additional plants may also be located further upstream and downstream than the survey assessed. As previously mentioned, there are AC CDC historical records showing the species directly in the Project site (refer to **Figure 5.7.1**).

Cut-leaved anemone was found at one location with two individuals directly in the Project site and back from the river on the edge of the forest. This plant is ranked as S2 (rare) by the AC CDC and its provincial population is considered rare. This species is common in open woodlands and fields, and does not typically occur on the banks of water bodies; therefore, it is unlikely to be affected by the Project as there will be no clearing and the majority of work is occurring within and directly around the impoundment waters.

No critical habitat, protected areas, or unique habitat designation related to vegetation and/or rare plants are present within the Project site.

5.7.3 Assessment of Potential Interactions between the Project and Vegetation and Wetlands

The potential interactions between the Project and vegetation and wetlands are assessed in this section.

5.7.3.1 Potential Interactions

In general, Project activities (particularly those involving ground disturbance) have the potential to cause adverse environmental effects through the proposed physical destruction or alteration of wetland habitat (if any are present), as well as terrestrial and aquatic vegetation.

Though no wetlands are thought to be present within the Project site or the surrounding area, the Project could interact with wetlands (if identified) and vegetation upstream and downstream of the Station throughout the life extension activities. Given the steep embankments of the Nepisiguit River, the cascading nature of the Nepisiguit River at this location, and the fact that lower water elevations in the impoundment are expected during multiple phases of work, there is thought to be little to no potential for wetlands to form during or following completion of the Project. Wetlands are therefore not discussed or assessed further in this EIA Registration document.

The primary possible interactions with vegetation include the direct loss of vegetation communities through Project activities including drawdown of the impoundment when constructing cofferdams required to replace the two rubber bladders as well as equipment requiring set-up on the banks of the Nepisiguit River to accommodate the bridge replacement/repair, unit upgrades, as well as dry work to repair concrete which could include staging materials, trucks, and cranes. Given there is little ground disturbance of undisturbed land associated with the Project phases and activities (except for some possible vegetation management of disturbed areas for use as laydown areas), there is little interaction with vegetation anticipated other than from short-term dewatering of the impoundment (which may affect hydrophilic plant species) as well as from potential additional laydown areas near the current parking lot (which have already been previously disturbed). The wet work done by divers as well as any assessment or repairs carried out from a boat are expected to have a negligible impact on vegetation communities. As mentioned above, indirect loss of vegetation communities may result from changes in hydrology within the Project site and redistribution of sediment downstream of the dam. More specifically, the Project may interact with vegetation in the following ways:

- Equipment used in any of the phases could introduce invasive and/or exotic vegetation species;

- Project activities have the potential to alter natural drainage patterns and increase erosion rates;
- Project activities have the potential to destroy rare plants from direct disturbance if they are present in the Project site;
- Shoreline compaction and degradation from equipment required during Project activities may cause a direct loss of vegetation communities;
- Impoundment drawdown required to access sections requiring concrete repairs as well as to construct cofferdams for bladder replacements will result in changes in hydrology (i.e., decreased water level causing drying of previously wet soils) which may interact with riparian vegetation communities;
- Sediments trapped behind the dam could be released during the drawdown of the impoundment. The downstream transportation and deposition of these sediments may cause a direct loss of aquatic vegetation communities; and
- A spill or fire or other accidental or unplanned event (refer to **Section 7.0**) which could affect vegetation within the Project site.

5.7.3.2 Mitigation

Mitigation is identified for each interaction in relation to vegetation and wetlands in an attempt to prevent the interaction from occurring if possible, or to reduce the severity, magnitude, geographic extent, frequency, or duration of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been identified as appropriate mitigation strategies. In addition, several acts, codes, regulations and guidelines may require appropriate actions be conducted as mitigation measures prior to or during the interaction. The following mitigation will be implemented as a part of the Project:

- The area to be disturbed by the Project will be minimized to the extent possible (i.e., limited to the area which is required to accomplish the Project objectives) including the size and shape of cofferdams;
- The duration of dewatering of the impoundment will be minimized to the extent possible;
- Efforts will be made to maintain mature vegetation along the edges of the site, particularly in riparian areas;
- A watercourse and wetland alteration (WAWA) permit will be obtained for work in or within 30 m of the watercourse;
- Project activities will comply with the conditions of the WAWA permit;
- Proper erosion and sediment control measures (e.g., check dams, silt curtains) will be installed and checked regularly to confirm they are continuing to operate properly to minimize potential effects to the impoundment as well as downstream habitat;
- Shoreline stabilization measures will be installed where the potential for erosion is anticipated and repaired in a timely manner when found to be damaged or deficient;

- Heavy equipment will be properly cleaned prior to mobilizing to site to avoid potential introduction of exotic and invasive species;
- During Project activities, efforts will be made to avoid disturbing areas where SOCC or SAR are known to be present (e.g., Drummond's rockcress), or other management implemented on discussion with applicable regulatory authorities;
- Vegetation habitats affected by the changes in water levels caused by drawdown of the head pond are anticipated, however, these conditions will only be temporary and the length of time they are experienced will be limited as much as possible; and
- An emergency response plan (ERP) for accidental spills, emergencies, incidents or storm events will be completed and detailed in the PSEMP, and the contractor will be required to provide spill response training to construction personnel.

5.7.3.3 Characterization of Potential Interactions Following Mitigation

Though there is little ground disturbance expected to accomplish the Project phases and activities, the Project will be developed such that the area of disturbance within the Project site is minimized to that which is required to meet Project objectives.

Buffers will be maintained, where possible, around watercourses and areas of plant SAR/SOCC, if identified, to minimize the loss of valued vegetation communities. If buffers cannot be maintained, additional mitigation will be developed in consultation with applicable regulatory authorities.

It is not anticipated that Project activities will result in affecting a local population of Drummond's rockcress within the Project site, given that its presence is noted downstream of the Station which will involve little ground disturbance except for conducting structural repairs, although these activities will be conducted largely within water. If the known populations of Drummond's rockcress or other rare species identified during the desktop analysis or the field surveys cannot be avoided and are affected by the Project, consideration will be given to re-seeding the portions of the Project site where they were identified, following the completion of the Project phases.

Applicable authorization (i.e., WAWA permit) will be secured with NBDELG prior to undertaking activities within 30 m of the watercourse (i.e., Nepisiguit River). For heavy equipment mobilizing to the site, contractors will be required to properly clean equipment prior to mobilizing to the site so as to avoid the transfer of exotic or invasive plant species to the area. Given current knowledge as informed by the desktop assessment discussed previously, the loss of SAR/SOCC vegetation communities is not anticipated as a direct result of the Project with the appropriate implementation of the mitigation measures presented.

Preventative erosion control measures during Project activities, especially during impoundment drawdown and cofferdam construction, are expected to prevent any sedimentation effects that could negatively impact vegetation communities downstream of the Station.

The anticipated change to vegetation communities as a result of changing water levels in the impoundment or upstream of the Station during drawdown activities are only anticipated to have a temporary effect (if at all) with no permanent habitat loss. If a seasonal loss of rare vegetation communities occurs as a result of indirect effects associated with the temporary drawdown of the impoundment, it would be expected that such vegetation would re-establish during subsequent years as long as there is no direct disturbance to them.

5.7.4 Summary

Based on the above, with planned mitigation, authorization, where applicable, and properly installed environmental protection measures, and given the existing context of the Project site which does not harbour any wetlands and no vegetation SOCC that cannot be avoided, the potential interactions between the Project and vegetation and wetlands are not expected to be substantive.

Surveys for vegetation and wetlands were carried out over several days in June and July of 2021, where a total of 198 vascular plants species were identified within the Project site and surrounding area. Of these, there were a total of two SOCC and no SAR. The two species of SOCC are cut-leaved anemone and Drummond's rockcress (both ranked as S2 [rare] by the AC CDC). No wetlands, critical habitat, protected areas, or unique habitat designation related to vegetation and/or rare plants, are present within the Project site.

Lastly, adaptive management measures will be implemented as necessary to address any changes to valued vegetation communities (e.g., SAR or SOCC) as they arise.

5.8 Wildlife and Wildlife Habitat

The potential interactions between the Project and wildlife (including species at risk and birds) and their habitats are assessed in this section.

5.8.1 Scope of VC

Wildlife and wildlife habitat includes wildlife (fauna) and the habitats that support wildlife species. This valued component (VC) is focused on birds, mammals (including bats), invertebrates, and herptiles (i.e., reptiles and amphibians) within terrestrial components of their lifecycle, as well as the habitats that support them. Wildlife and wildlife habitat has been selected as a VC because, in general, the environment around the Station, and the Nepisiguit River itself, support terrestrial wildlife and are important to the public for the biodiversity they support.

There is the potential for interactions between wildlife, its habitat, and proposed Project activities. Particular focus is placed on wildlife species at risk (SAR) and species of conservation concern (SOCC) (defined below) as identified by provincial and federal regulatory agencies. SAR/SOCC are often susceptible to changes in the environment and are therefore useful indicators of ecosystem health and regional biodiversity.

Both provincial and federal legislation provides protection to designated bird, mammal, herptile, and other species at risk. SAR are protected under the federal *Species at Risk Act* (SARA) and the New Brunswick *Species at Risk Act* (NB SARA). In addition, most bird species, specifically, are protected under the *Migratory Birds Convention Act* (MBCA).

In this EIA Registration document, we define "species at risk" (SAR) as those species that are listed as "Extirpated", "Endangered", "Threatened", or "Special Concern" on Schedule 1 of the federal SARA or the NB SARA. We also define "species of conservation concern" (SOCC) as those species that are not SAR but are listed in other parts of SARA, NB SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of "extremely rare" [S1], "rare" [S2], or "uncommon" [S3]).

The wildlife and wildlife habitat VC has connections to the vegetation and wetlands VC (**Section 5.7**) because of its relationship with vegetation, hydrology, landforms, and soil components that are key components of wildlife habitat. Vegetation communities and wetlands (and plant SAR) which comprise habitat are discussed in **Section 5.7**. Aquatic wildlife/fish are considered in **Section 5.6**.

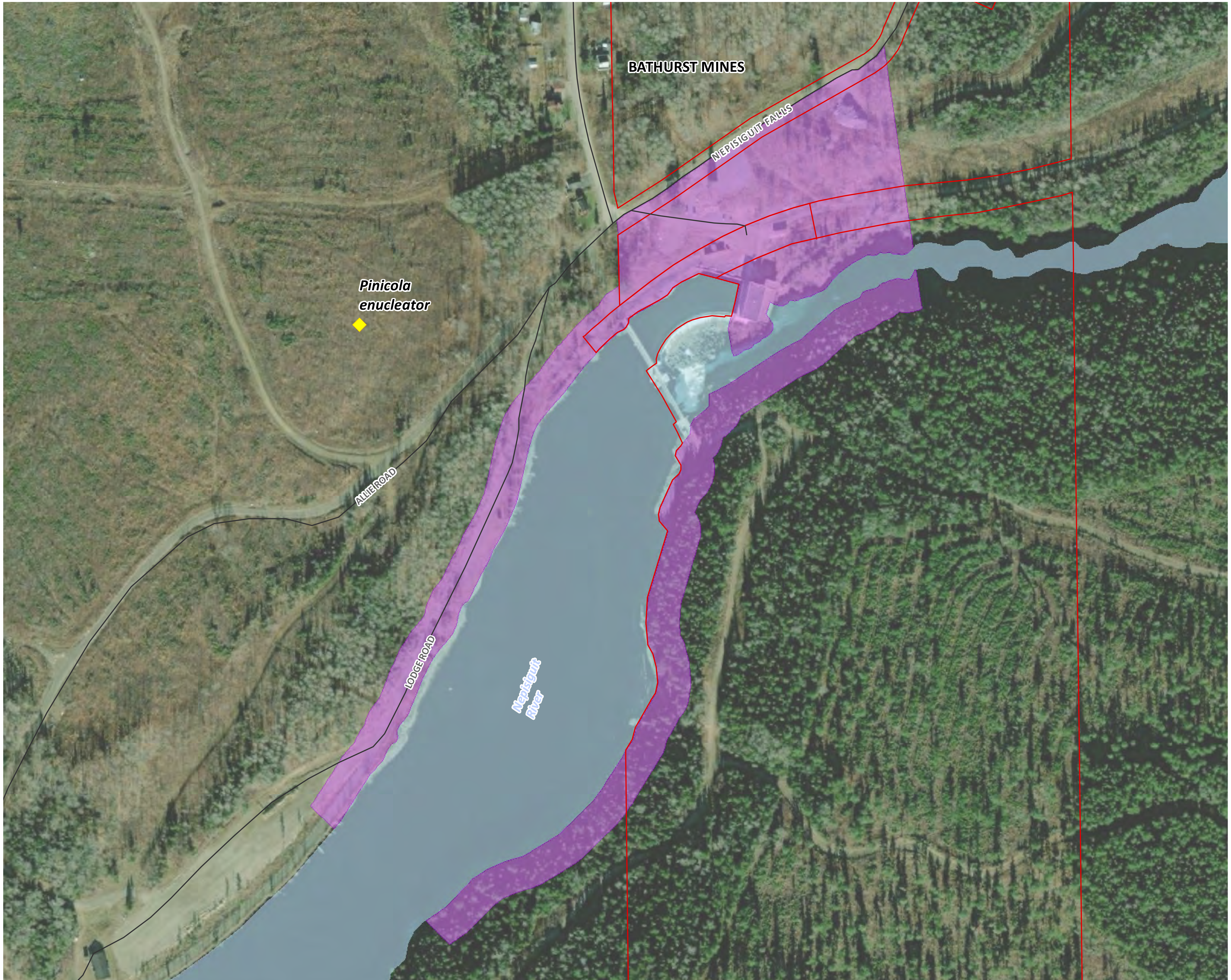
The local assessment area (LAA) for wildlife and wildlife habitat is defined as the riparian area approximately 500 m upstream and 500 m downstream of the Station, within 30 m of the Nepisiguit River.

5.8.2 Existing Conditions

The information regarding the presence and characterization of wildlife and wildlife habitat within the Project site and surrounding area was derived from several desktop information sources including existing databases and secondary information sources (i.e., desktop analysis). This desktop analysis is supplemented by a site-specific field evaluation of the Project site and the LAA completed on various occasions during the spring and summer of 2021. The results of these field surveys are not yet available, but will be documented in a separate technical report that is being prepared in parallel to this EIA Registration, which will be submitted to the Technical Review Committee (TRC) as supplemental information during the course of the EIA review of the Project. The Project site and surrounding area for wildlife and wildlife habitat is shown in **Figure 5.8.1** and **Figure 5.8.2** below. Specifically, targeted field surveys for owls, nighthawks, breeding migratory birds, and bats were conducted in spring and summer of 2021, combined with incidental observations of other wildlife. Desktop Analysis.

Desktop Analysis Methods and Data Sources

Information regarding the use of the Project site and surrounding area by wildlife and presence of wildlife habitat was derived from several sources including existing databases and secondary information sources. To provide information on potential occurrences of rare and endangered wildlife, and unique or sensitive wildlife habitats potentially existing within and/or near the Project site, a review of the following existing data and information sources was conducted:



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

LOCAL ASSESSMENT AREA (LAA) FOR WILDLIFE AND WILDLIFE HABITAT

FIGURE 5.8.1

Species at Risk / Species of Conservation Concern - Wildlife

Road

NB Power Property

Local Assessment Area

Waterbody

0 25 50 100 meters

SCALE 1:3,401

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB, ACCDC

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

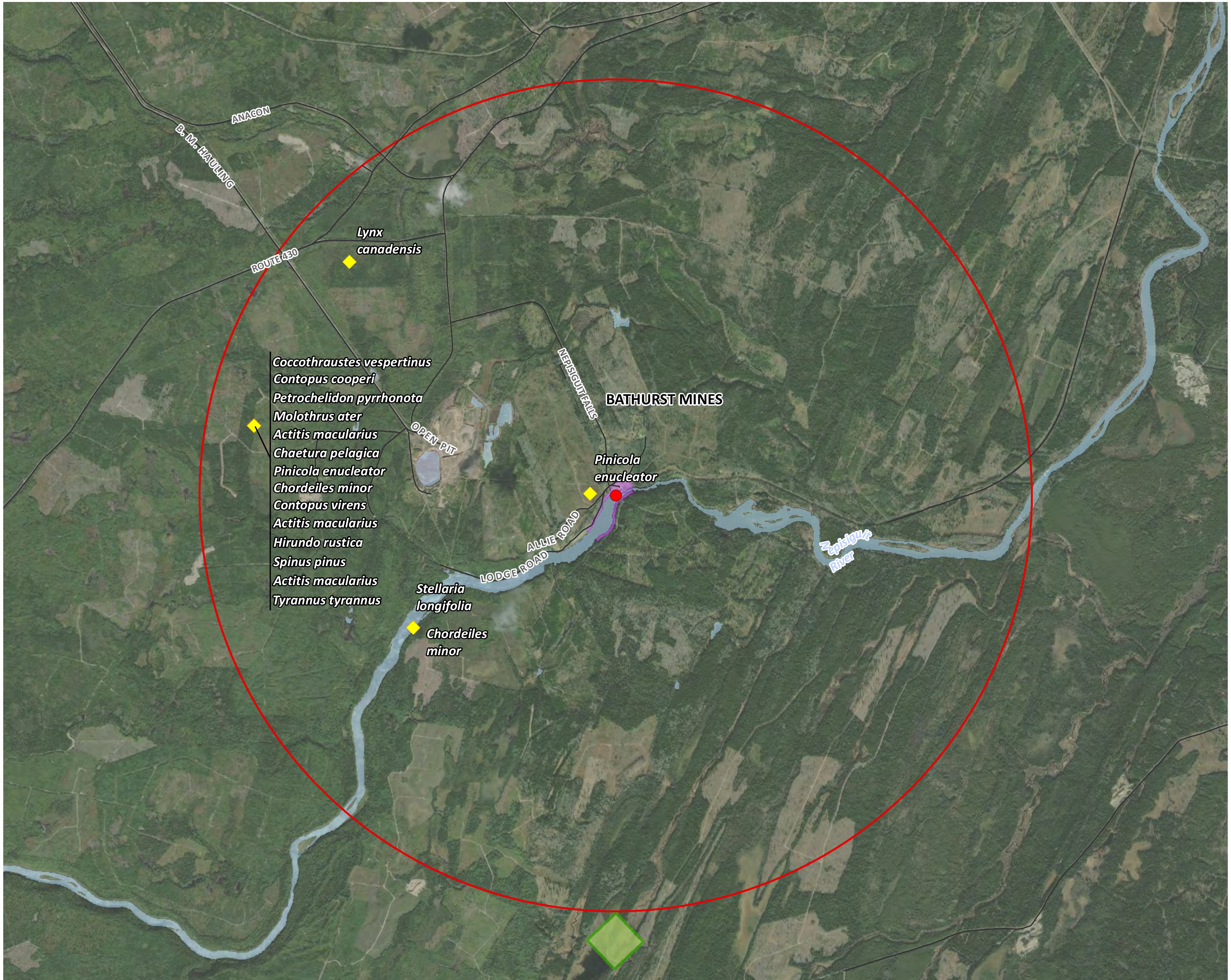
DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-09-14

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F581_LAA_WildlifeHabitat.mxd



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

HISTORICAL RECORDS OF WILDLIFE SAR/SOCC WITHIN 5 KM OF THE STATION

FIGURE 5.8.2

- Project Location
- Species at Risk / Species of Conservation Concern - Wildlife
- Road
- Project Location 5 km Radius
- Local Assessment Area
- Doctor Bells Meadow Site Environmentally Significant Area
- Waterbody

0 370 740 1,480 meters

SCALE 1:45,000

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING, GEONB, ACCDC

MAP CREATED BY: GAM
MAP CHECKED BY: JD
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641
STATUS: DRAFT
DATE: 2021-09-21

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F582_HistoricalRecordsWildlife.mxd

- Previous background information from other similar assessments completed in the general area;
- Listed species by COSEWIC;
- Listed species under the federal SARA;
- Listed species under NB SARA; and
- Ranked species by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED).

As part of the desktop assessment, a site-specific AC CDC report (AC CDC 2021) was obtained for the Project site (refer to **Appendix A**). The report provided recorded historical observations of SAR/SOCC flora and fauna species, as well as identified environmentally sensitive or managed areas within 5 km of the Project site. Wildlife SOCC identified as extremely rare (S1), rare (S2), or uncommon (S3) are also identified.

Other available background information sources and mapping reviewed to identify and assess wildlife and wildlife habitat presence at the Project site included:

- Ecological Reserves in the Maritimes;
- Environmentally Sensitive Areas (ESAs) database;
- Atlas of Breeding Birds of the Maritime Provinces (MBBA);
- Important Bird Areas (IBAs) of Canada;
- Federally-designated Migratory Bird Sanctuaries;
- Provincially-identified deer wintering areas (DWAs); and
- Identified Protected Natural Areas and Wildlife Management Zones (WMZ).

The information obtained from this desktop analysis was supplemented by a field survey conducted by Boreal biologists subcontracted by Dillon on various occasions during the spring and summer of 2021, to characterize site-specific environmental conditions for wildlife (i.e., nocturnal owls, nighthawks, breeding birds, and bats), combined with incidental observations of other wildlife, near the Station. The results of these field surveys are summarized below in **Section 5.8.2.1**, with additional detail in a separate technical report to be submitted as supplemental information, later during the EIA review.

<u>Desktop Analysis Results – Resident and Migratory Birds</u>

The vast majority of bird species found in New Brunswick are migratory and either breed in the province during the summer months, or pass through it during the spring and fall migratory periods. Jurisdiction for many migratory birds is federal, since migratory birds cross both provincial and international boundaries. The MBCA is the federal law which protects migratory birds in Canada (with similar legislation in the United States). The Act prohibits killing, injuring or harassing migratory birds, their nests, or their young. Migratory birds that are protected under the MBCA in Canada, and that are relevant to the Project, include:

- Waterfowl (e.g., ducks and geese);
- Rails (e.g., coots, gallinules, sora, and other rails);
- Shorebirds (e.g., plovers and sandpipers); and
- Songbirds (e.g., thrushes and warblers).

Furthermore, species listed pursuant the federal SARA or the NB SARA are afforded further protection as harm, the destruction of their nest, eggs, or young is prohibited.

Birds not addressed under federal jurisdiction include grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, and kingfishers. Most birds not included in this list are protected under provincial laws, most notably the New Brunswick *Fish and Wildlife Act*. The New Brunswick *Fish and Wildlife Act* protects all fish and wildlife species (including all vertebrate animals or birds) from angling, hunting, trapping and other forms of intentional take, except under the authority of permits or licences. The Act also prohibits the disturbance, gathering or collection of the nests or eggs of any bird species, except under the authority of a permit. Under Section 4 of the Act, some wildlife and bird species (including American Crow [*Orvus brachyrhynchos*], Double-crested Cormorant [*Phalacrocorax auritus*], and European Starling [*Sturnus vulgaris*]) may be taken if they present a risk of injury to landowners, or a risk of property damage, but this requires a separate permit.

Maritime Breeding Bird Atlas

The Maritime Breeding Bird Atlas (MBBA) database (Stewart et al. 2015) provides information on the presence of breeding bird species in counts conducted between 2006 and 2010. Within the MBBA Second Atlas, the Project site lies within Region #3, Acadian Peninsula, near the centre of Square #20KT85. During the MBBA period of 2006-2010, a total of 71 species of birds were recorded within this square. Of these species, 18 were confirmed as breeding, 17 were probable breeders, and 36 were possible breeders. There were eight SAR or SOCC detected during the most recent MBBA period in this square. These species included: Common Nighthawk (*Chordeiles minor*), Chimney Swift (*Chaetura pelagica*), Olive-sided Flycatcher (*Contopus cooperi*), Pine Siskin (*Spinus pinus*), Barn Swallow (*Hirundo rustica*), Eastern Kingbird (*Tyrannus tyrannus*), Eastern Wood-pewee (*Contopus virens*), and Spotted Sandpiper (*Actitis macularius*) (Stewart et al. 2015).

NBDNRED's *General Status of Wild Species* (NBDNRED 2021) reports that there are 407 extant bird species known to occur in the New Brunswick, of which 143 are considered accidental (NBDNRED 2021). Of the species that regularly occur in the province during at least part their lifecycle, 12 species are listed as "At Risk", 12 are listed as "May be At Risk", and 49 are considered "Sensitive".

Important Bird Areas

The nearest IBA is the Pokeshaw Rock site (NB005) (BSC 2020a; 2020b). This IBA is a sea stack that possesses steep, sheer cliffs that rise from the sea 60 m from the shoreline, located on the Chaleur Bay coast approximately 60 km northeast of the Project site. This small and isolated area is especially important for Double-crested Cormorants, as 1,371 nesting pairs were recorded in 1986 (no more recent surveys have been completed). This IBA is uniquely important based on its lack of terrestrial predators as well as its proximity to food resources on the mainland. Similar habitat is not present in or around the Project site, and no Double-crested Cormorants have ever been recorded in the area.

AC CDC Data Review

A review of the AC CDC data as compiled in a site-specific report (AC CDC 2021) indicated that there were 22 records of 13 vertebrate SAR or SOCC historically observed within 5 km of the Project site, and 12 of those were avian species. Of these avian species, seven are considered SAR, and the remainder are considered SOCC. The seven avian SAR include one "location sensitive" bird species (Bald Eagle, [*Haliaeetus leucocephalus*]) which intersects the Project site (AC CDC 2021).

Of the seven bird SAR historically identified by the AC CDC within 5 km of the Project site, four are listed as Threatened pursuant to SARA, and all four of those species are also listed as Threatened pursuant to NB SARA. Two more are listed as Special Concern pursuant to SARA, and one (Bald Eagle) is listed as Endangered pursuant to NB SARA but is not listed under SARA. The SAR bird species identified by the AC CDC as having been historically observed within 5 km of the Project site, as well as their habitat requirements and potential to occur within the region, are discussed in **Table 5.8.1**, below. SOCC and regionally rare species lists are provided in **Table B.2** in **Appendix B**.

Table 5.8.1: Bird Species at Risk Historically Observed within 5 km of the Project site (AC CDC 2021)

Species	Status[1]	Breeding Habitat	Potential to Occur in Project Site
Bald Eagle (*Haliaeetus leucocephalus*)	**COSEWIC:** Not at Risk **SARA:** Not listed **NB SARA:** Endangered **AC CDC S-Rank:** S4/1 At Risk	Bald Eagles typically nest in large, tall conifers near or adjacent a body of water. They will often re-use nest sites year-after-year.	This species may occur within the Project site as suitable nesting habitat does exist; however, no raptor nests are known in the vicinity.
Barn Swallow (*Hirundo rustica*)	**COSEWIC:** Threatened **SARA:** Threatened **NB SARA**: Threatened **AC CDC S-Rank:** S2B,S2M/3 Sensitive	Barn Swallows typically nest on human-made structures such as abandoned buildings or barns and forages in open areas (COSEWIC 2011).	This species could use the Project site as foraging habitat, although it is unlikely it would nest on the dam, powerhouse/gatehouse or bridges as they are the only manmade structures within the site.
Chimney Swift (*Chaetura pelagica*)	**COSEWIC:** Threatened **SARA:** Threatened **NB SARA**: Threatened **AC CDC S-Rank:** S2S3B,S2M/1 At Risk	Historically, the Chimney Swift used mainly large hollow trees for nesting sites but have adopted chimneys as preferred nesting sites. They are generally associated with urban and rural areas where chimneys are available for nesting and roosting. Chimney Swifts are aerial	This species could use the Project site as foraging habitat, although it is unlikely it would nest on the dam, powerhouse or bridges as they are the only manmade structures within the site and there would not be any large hollow trees present.

Species	Status[1]	Breeding Habitat	Potential to Occur in Project Site
		foragers and tend to concentrate near water where insects are abundant (COSEWIC 2007a).	
Common Nighthawk (*Chordeiles minor*)	**COSEWIC:** Special Concern **SARA:** Threatened **NB SARA**: Threatened **AC CDC S-Rank:** S3B,S4M/1 At Risk	Common Nighthawk typically breeds throughout the Maritimes and nests on the ground in open vegetation free habitats (COSEWIC 2007b).	This species is likely to use the Project site as foraging habitat. Nesting habitat for this species could exist within the site in the form of rocky outcrops along the Nepisiguit River but there is minimal potential.
Olive-sided Flycatcher (*Contopus cooperi*)	**COSEWIC:** Special Concern **SARA:** Threatened **NB SARA**: Threatened **AC CDC S-Rank:** S3B,S3M/1 At Risk	Typically breeds in coniferous edges and open areas with perches (e.g., forest openings near wetlands and clear-cuts) (COSEWIC 2007c).	This species may occur within the Project site as suitable nesting habitat does exist.
Eastern Wood-pewee (*Contopus virens*)	**COSEWIC:** Special Concern **SARA:** Special Concern **NB SARA**: Special Concern **AC CDC S-Rank:** S4B, S4M/2 May Be At Risk	Most often associated with the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in forest stands of intermediate age and in mature stands with little understory vegetation. During migration, a variety of habitats are used, including forest edges and early successional clearings (COSEWIC 2012c).	This species may nest and forage within the Project site as suitable nesting habitat exists along the forested riverbanks.
Evening Grosbeak (*Coccothraustes vespertinus*)	**COSEWIC:** Special Concern **SARA:** Special Concern **NB SARA**: Special Concern **AC CDC S-Rank:** S3B, S3S4N/2 May Be At Risk	Breeds in mature and second-growth coniferous forests, but will occasionally nest in orchards, parks and deciduous woodlands (Peterson 2002, Sibley 2016).	This species may nest and forage within the Project site as suitable nesting habitat exists along the forested riverbanks.

Environment and Climate Change Canada (ECCC), through its Canadian Wildlife Service (CWS), provides general avoidance information for migratory birds, including regional nesting periods during which most migratory bird species covered under the MBCA are likely to breed.

The Project site is located in Nesting Zone C4, where most migratory birds breed from mid-April to late August each year (specifically April 18 to August 18 for Nesting Zone C4; ECCC 2020b). However, it is noted that some avian species nest outside of this period, including corvids, crossbills, owls, and waxwings.

Breeding bird surveys were conducted in spring and summer 2021 in support of this EIA Registration document. A summary of the results of the field surveys is provided in **Section 5.8.2.1** below, with full details to be provided to the TRC for review in a separate technical report, later during the EIA review.

Desktop Analysis Results – Mammals (Including Bats)

NBDNRED's "*General Status of Wild Species*" (NBDNRED 2021) reports that there are 52 species of mammals known to occur within New Brunswick, and an additional seven which are extinct, extirpated, or unverified. Of these 52 species, Canada lynx (*Lynx canadensis*) is listed as Endangered under NB SARA, Gaspé shrew (*Sorex gaspensis*) is listed as Special Concern under Schedule 3 of SARA, and three bat species are listed as Endangered under SARA, including the little brown bat (little myotis; *Myotis lucifugus*), northern long-eared bat (northern myotis; *Myotis septentrionalis*), and eastern pipistrelle (tri-coloured bat; *Perimyotis subflavus*).

There are records of historical observations of Canada lynx within 5 km of the Project site based on the AC CDC report and is listed as Endangered under NB SARA (AC CDC 2021). Their preferred habitat is mature and dense boreal forests with an abundance of prey species such as the snowshoe hare (Vashon 2016). Because this habitat does not occur directly on the Project site, as well as the anthropogenic presence at the site (e.g., workers, residential buildings nearby), it is highly unlikely that the species would be present within the Project site, although their potential presence in the surrounding area to the Station cannot be discounted given the remote, forested nature of the area.

The Canada lynx is not a location sensitive species according to the AC CDC classification system, and there is an abundance of suitable habitat in the general area.

A review of the AC CDC report (AC CDC 2021) indicated that no historical observations of any species of bats have been reported within 5 km of the Project site.

Bat surveys were conducted as a part of this assessment by deploying an acoustic bat monitor at the Station and recording for a 32 day period from June 8 to July 10, 2021. The results of bat surveys conducted during spring and summer 2021 are presented in summary form below in **Section 5.8.2.2** and further details presented will be presented in a separate technical report, later during the EIA review. Bat surveys targeted both foraging habitat and potential roosting habitat within the Project site.

Lastly, the Project site does not provide suitable deer wintering habitat due to the limited amount of canopy cover throughout most of the property and the developed nature of site and the close proximity of a residential street, although the potential presence of deer in the surrounding area to the Station cannot be discounted given the remote forested nature of the area.

Desktop Analysis Results – Invertebrates

Lists of butterfly and odonate (dragonfly and damselfly) species in New Brunswick are maintained in the NBDNRED's *General Status of Wild Species* database (NBDNRED 2021). The database currently lists 80 butterfly and 131 odonate species known to occur in the province. Of these species, one (maritime ringlet, *Coenonympha nipisiquit*, a butterfly) is an SAR listed as Endangered under SARA and NB SARA, 15 (4 butterflies and 11 odonates) are considered May be At Risk SOCCs, and 13 (one butterfly and 12 odonates) are considered Sensitive (neither SAR nor SOCC). The cobblestone tiger beetle (*Cicindela marginipennis*), maritime ringlet, and skillet clubtail (*Gomphus ventricosus*, an odonate) are SAR that are listed as Endangered under SARA, while the monarch butterfly (*Danaus plexippus*) and pygmy snaketail (*Ophiogomphus howei*, an odonate) are considered to be SAR as they are listed as Special Concern under Schedule 1 of SARA.

The skillet clubtail, cobblestone tiger beetle, and the maritime ringlet have very limited populations in New Brunswick that are not located in the immediate vicinity of the Nepisiguit River. The cobblestone tiger beetle is endemic to only the Saint John River system and Grand Lake (Environment Canada 2013). Similarly, the skillet clubtail is only known in the Maritimes from records along the Saint John River below the Mactaquac dam (Environment Canada 2013). Lastly, the maritime ringlet is restricted to areas directly around the Chaleur Bay in Northern New Brunswick and portions of the Gaspé region of Québec (COSEWIC 2009) and due to the Project site's distance from the Chaleur Bay (approximately 30 km inland), it is not expected to be present near the Station.

A review of the AC CDC report (AC CDC 2021) indicates that there are no invertebrate SOCC species previously recorded within 5 km of the Project site.

Desktop Analysis Results – Herptiles

NBDNRED's *General Status of Wild Species* database (NBDNRED 2021) reports that there are 7 reptile and 16 amphibian species known to occur in New Brunswick. Of these species, one (wood turtle [*Glyptemys insculpta*]) is considered to be At Risk, and one (dusky salamander, *Desmognathus fuscus*) is considered to be Sensitive. Both SARA and NB SARA list the wood turtle as Threatened and the snapping turtle (*Chelydra serpentine*) as Special Concern, both considered SAR.

Wood turtles are generally associated with watercourses and their riparian habitats. Individuals nest on sandy and gravelly riverbanks but will also make use of other features such as sand pits and road embankments near watercourses that provide a sandy or gravelly substrate. Snapping turtles generally inhabit ponds, sloughs, streams, rivers, and shallow bays that are characterized by slow moving water, aquatic vegetation, and soft, muddy bottoms. Both wood turtles and snapping turtles are known to overwinter in deep pools in larger rivers and in deep ponds.

A review of the AC CDC report (AC CDC 2021) indicated that there were no records of historical observations of wood turtle or snapping turtle within 5 km of the Project site.

A targeted field survey to identify if herptiles are present was not conducted as part of this Project. Given that turtles generally favour sandy/gravelly substrates as opposed to the rocky/bedrock nature of the Nepisiguit River and its steep embankments at the Station, the habitats in the Project site are not likely suitable for wood or snapping turtles. If any are observed during any of the Project phases and activities, a mitigation plan will be developed.

Desktop Analysis Results – Environmentally Sensitive Areas

The AC CDC (2021) indicated that there is one biologically significant area within 5 km of the Project footprint. The Doctor Bells Meadow Site Environmentally Significant Area (ESA) is located 5 km south of the Project site (refer to **Figure 5.8.2** above; AC CDC 2021).

There are no provincially identified deer wintering areas or Protected Natural Areas (PNAs) within 5 km of the Project site.

5.8.2.1 Field Surveys

The methods used to carry out the various field surveys during spring and summer 2021, and a summary of the results of these field surveys, are provided below.

Field Survey Methods and Results – Breeding Birds

Area searches within and around the Project site were conducted on June 9 and July 6, 2021 for a duration of approximately 3 hours on each day.

The surveys were conducted by experienced terrestrial ecologists from Boreal, a subconsultant to Dillon, for these and other surveys; NB Power's Indigenous field monitor accompanied Boreal staff for these surveys. Area searches started no later than 1 hour after sunrise and continued for approximately 3 hours. Surveys were conducted on days when the weather conditions were favourable (i.e., light winds and no precipitation).

The location of each bird detected within or around the Project site was recorded. Evidence of breeding birds such as nests, territorial displays, alarm calling, individuals flushed, mating, and aggressive defending of territories was recorded.

Species observed or heard singing in suitable nesting habitat were classified as possible breeders. Species exhibiting the following behaviours were also classed as probable breeders:

- courtship behaviour between a male and female;
- birds visiting a probable nest site;
- birds displaying agitated behaviour; and
- male and female observed together in suitable nesting habitat.

Species were confirmed as breeding if any of the following items or activities were observed:

- nest building or adults carrying nesting material;
- distraction display or injury feigning;
- recently fledged young;
- occupied nest located; and
- adult observed carrying food or fecal sac for young.

Table 5.8.2 provides a summary of habitat types by area and percentage of the Project site occupied by each type. Habitat types identified in the NBDNRED forest inventory were verified in the field during the field surveys and adjusted accordingly where the forest inventory differed from the field survey.

Table 5.8.2: Summary of Habitat Types by Area and Percent Cover in Surveyed Area

Stand Type	Area (ha)	Percent of Area (%)
Anthropogenic habitat	1.1	28.2
Rocky and barren riverbank habitat	0.3	7.7
Immature boreal forest habitat	2.5	64.1
Total	**3.9**	**100**

A total of 51 bird species comprised of 262 individuals, including two SAR (a Bald Eagle and a Common Nighthawk), were recorded during the field surveys for this Project. The most frequently recorded species were a Red-eyed Vireo (*Vireo olivaceus*), Northern Parula (*Parula americana*), Purple Finch (*Carpodacus purpureus*), American Redstart (*Setophaga ruticilla*), and Common Goldeneye (*Bucephala clangula*). These species were characteristic of transitional boreal forest habitats that are typical of the region. No raptor nests were noted.

When birds were visually detected, they were observed for evidence of nesting behaviour (e.g., agitation, distraction displays, pairs in suitable habitat, etc.). The most compelling evidence of breeding observed for each species was recorded in **Table 5.8.3** below.

Table 5.8.3: Summary of Bird Species Recorded During the Spring/Summer 2021 Breeding Bird Surveys

Common Name	Scientific Name	AC CDC S-Rank[1]	SARA or NB SARA Status	NBDNRED Status	Highest breeding status[2]	Number Recorded
Alder Flycatcher	*Empidonax alnorum*	S5B, S5M	-	Secure	PO	2
American Black Duck	*Anas rubripes*	S5B,S4N,S5M	-	Secure	OBS	1
American Redstart	*Setophaga ruticilla*	S5B,S5M	-	Secure	PO	13
American Robin	*Turdus migratorius*	S5B,S5M	-	Secure	PO	4
American Wigeon	*Anas americana*	S4B,S4S5M	-	Secure	PO	1
Bald Eagle	*Haliaeetus leucocephalus*	S4	Endangered (NB SARA)	At Risk	PO	1
Barred Owl	*Strix varia*	S5	-	Secure	PO	1
Belted Kingfisher	*Megaceryle alcyon*	S5B,S5M	-	Secure	PO	3
Blackburnian Warbler	*Dendroica fusca*	S5B,S5M	-	Secure	PO	3
Black-capped Chickadee	*Poecile atricapilla*	S5	-	Secure	PO	5

Common Name	Scientific Name	AC CDC S-Rank[1]	SARA or NB SARA Status	NBDNRED Status	Highest breeding status[2]	Number Recorded
Black-throated Blue Warbler	*Dendroica caerulescens*	S5B,S5M	-	Secure	PO	9
Black-throated Green Warbler	*Dendroica virens*	S5B,S5M	-	Secure	PO	1
Blue Jay	*Cyanocitta cristata*	S5	-	Secure	PO	7
Blue-headed Vireo	*Vireo solitarius*	S5B,S5M	-	Secure	PO	6
Broad-winged Hawk	*Buteo platypterus*	S5B,S5M	-	Secure	CO	2
Cedar Waxwing	*Bombycilla cedrorum*	S5B,S5M	-	Secure	PO	2
Chestnut-sided Warbler	*Dendroica pensylvanica*	S5B,S5M	-	Secure	PO	6
Common Goldeneye	*Bucephala clangula*	S4B,S5M,S4N	-	Secure	PO	13
Common Grackle	*Quiscalus quiscula*	S5B,S5M	-	Secure	OBS	1
Common Loon	*Gavia immer*	S4B,S4M,S4N	-	Secure	PO	3
Common Merganser	*Mergus merganser*	S5B,S4N,S5M	-	Secure	PO	3
Common Nighthawk	*Chordeiles minor*	S3B,S4M	Threatened (SARA and NB SARA)	At Risk	PO	2
Common Yellowthroat	*Geothlypis trichas*	S5B,S5M	-	Secure	PO	4
Dark-eyed Junco	*Junco hyemalis*	S5	-	Secure	PRO	2
Double-crested Cormorant	*Phalacrocorax auritus*	S5B,S5M	-	Secure	PO	2
Eastern Phoebe	*Sayornis phoebe*	S5B,S5M	-	Secure	PO	1
Eastern Wood-pewee	*Contopus virens*	S4B,S4M	-	Secure	PO	1
Golden-crowned Kinglet	*Regulus satrapa*	S5	-	Secure	PO	3
Hairy Woodpecker	*Picoides villosus*	S5	-	Secure	PO	3
Hermit Thrush	*Catharus guttatus*	S5B,S5M	-	Secure	PO	9
Least Flycatcher	*Empidonax minimus*	S5B,S5M	-	Secure	PO	4
Mourning Warbler	*Oporornis philadelphia*	S4B,S5M	-	Secure	PO	1
Nashville Warbler	*Vermivora ruficapilla*	S5B,S5M	-	Secure	PO	4
Northern Flicker	*Colaptes auratus*	S5B,S5M	-	Secure	PO	2

Common Name	Scientific Name	AC CDC S-Rank[1]	SARA or NB SARA Status	NBDNRED Status	Highest breeding status[2]	Number Recorded
Northern Parula	*Parula americana*	S5B,S5M	-	Secure	PO	20
Ovenbird	*Seiurus aurocapilla*	S5B,S5M	-	Secure	PO	12
Pine Warbler	*Dendroica pinus*	S5B,S5M	-	Secure	PO	1
Purple Finch	*Carpodacus purpureus*	S4S5B,SUN,S5M	-	Secure	PO	16
Red-breasted Nuthatch	*Sitta canadensis*	S5	-	Secure	PO	9
Red-eyed Vireo	*Vireo olivaceus*	S5B,S5M	-	Secure	PO	37
Ruby-crowned Kinglet	*Regulus calendula*	S4B,S5M	-	Secure	PO	1
Ruffed Grouse	*Bonasa umbellus*	S5	-	Secure	PO	1
Sharp-shinned Hawk	*Accipiter striatus*	S4B,S5M	-	Secure	PO	1
Song Sparrow	*Melospiza melodia*	S5B,S5M	-	Secure	PO	8
Spotted Sandpiper	*Actitis macularius*	S3S4B,S5M	-	Secure	PO	1
Turkey Vulture	*Cathartes aura*	S3B,S3M	-	Secure	PO	2
Veery	*Catharus fuscescens*	S4B,S4M	-	Secure	PO	11
White-throated Sparrow	*Zonotrichia albicollis*	S5B,S5M	-	Secure	PO	3
White-winged Crossbill	*Loxia leucoptera*	S5	-	Secure	PO	2
Yellow-bellied Sapsucker	*Sphyrapicus varius*	S5B,S5M	-	Secure	PO	9
Yellow-rumped Warbler	*Dendroica coronata*	S5B,S5M	-	Secure	PO	3
						Total: 262

Notes:

[1] AC CDC S-Ranks as follows: S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (AC CDC 2021).

[2] Breeding Status Codes: OB: observed; PO: possible breeder; PR: probable breeder; CO: confirmed breeder.

Field Survey Methods and Results – Owls and Nighthawks

An owl survey was conducted by Boreal's biologist (accompanied by NB Power's Indigenous field monitor) on the evening of April 28, 2021, and a nighthawk survey was conducted on the evening of June 8, 2021. Both surveys began approximately 30 minutes after sunset, for a duration of approximately 30 minutes for each survey. The equipment used consisted of a Silent Listening Station and two Playback Calling Stations and the surveys were carried out within and near the Project site.

There were no records of owls during the targeted survey on April 28, 2021. There were two records of Common Nighthawks at the Project site during the targeted survey on June 8, 2021.

Further details on the methods and results of these surveys will be provided in a separate technical report, later during the EIA review.

Field Survey Methods and Results – Bats

The acoustic surveys for bats were conducted by an experienced terrestrial ecologist from Boreal. An acoustic data recorder was deployed along the north bank of the impoundment near to the west of the Station. This position was chosen to capture any activity of bats that might be active near the Station and foraging activity over the water (i.e., the impoundment) where insect prey availability tends to be high.

The acoustic data was recorded using a single Anabat Swift™ passive bat detector. The detector ran continuously between June 8 and July 10, 2021. The microphone was pointed downward above a 20 cm x 20 cm metal sheet mounted at a 45° angle to deflect sound upward into the microphone. The detectors were programmed to record bat passes from a half hour before sunset to a half hour after sunrise in order to determine relative activity patterns by species or species groups over time.

The bats encountered during the surveys were the little brown bat (little myotis, a SAR listed as Endangered under SARA) and the big brown bat (*Eptesicus fuscus*, a secure species). The data and records of these surveys were not completed at the time of submission of this EIA Registration; full results will be documented in a separate technical report, later during the EIA review.

Field Survey Results – Incidental Observations of Herptiles and Other Wildlife

Other SAR and SOCC wildlife species were not directly observed within the Project site during any of the field surveys. Direct and indirect (scat and tracks) observations of common wildlife species included white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), red-tailed fox (*Vulpes vulpes*), groundhog (*Marmota monax*), and chipmunk (*Tamias striatus*).

5.8.3 Assessment of Potential Interactions between the Project and Wildlife and Wildlife Habitat

As part of the desktop assessment, the habitat requirements of wildlife species identified as potentially occurring within and/or near the Project site were compared to the range of environmental conditions within the Project site to determine if suitable habitat was present for these taxa. Knowledge of the habitats present within the Project site was determined through an interpretation of aerial photography, topographic, and geological mapping. In instances where appropriate habitat was present for a particular species, that taxon was considered to be potentially present at the Project site, mitigation was identified, and potential impacts were assessed.

5.8.3.1 Potential Interactions

Project activities such as heavy equipment operation have the potential to interact with wildlife and wildlife habitat. Potential interactions on wildlife or their habitats include direct mortality, habitat loss and fragmentation, and sensory disturbance. These potential interactions are discussed in this section.

Migratory Birds

The primary possible interactions with birds due to the Project include habitat loss, destruction of nests, direct mortality due to collision, and sensory disturbance. The Project may interact with birds and bird habitat in the following ways:

- Direct mortality via collision with equipment and materials during the Project activities;
- Construction activities may alter or destroy migratory bird habitat;
- Activities may destroy or alter habitat for bird SAR or SOCC;
- Sensory disturbances from Project activities may deter birds from migrating into and using the Project site; and
- Sensory disturbances from Project activities may result in the abandonment of nests or increased rates of predation and exposure of hatchlings and eggs during temporary abandonment.

Mammals

The Project may interact with wildlife (fauna) and their habitat in the following ways:

- The Project footprint could cause loss of immature vegetation that provide habitat for wildlife;
- Disturbance from vehicles and heavy equipment may cause wildlife avoidance or disruption of wildlife activity (such as breeding and/or feeding);
- Sensory disturbance from noise, vibration, dust and fuel emissions may cause a disruption to wildlife species;
- Mobile equipment use during Project activities may cause direct injury or death of wildlife, particularly to small wildlife such as rodents and shrews, through collisions or destruction of dens and food sources; and
- Medium and large sized mammals are unlikely to suffer direct mortality from Project activities (with a low potential for accidental vehicle collisions; see **Section 7.0**, Accidents, Malfunctions, and Unplanned Events) as they would likely avoid the area in response to human presence and noise. However, such avoidance or behaviour could result in changes to normal movements, migration patterns, and other life cycle processes.

Herptiles

The Project may interact with herptiles (if they are present) and their habitat in the following ways:

- Direct mortality via collision with various equipment required around the site at different phases of the Project;
- Excavation and construction, especially during building of cofferdams, could result in habitat destruction or direct mortality; and

- There will be local habitat fragmentation during all of the phases of the Project, making it difficult for herptiles (if they are present) to move in specific areas of the site due to construction activities as well as drawdown of the impoundment.

Despite not being identified during the field surveys for this Project, it is possible that wood turtles or snapping turtles could be present near the Project site to forage during the summer season.

The main threat to these species is from vehicular collisions which affects adult survivorship, which, in turn, greatly influences population sizes.

5.8.3.2 Mitigation

The following mitigation measures are planned to reduce environmental effects on wildlife and wildlife habitat.

- The size of the Project site at all phases of work will be limited to that necessary to accomplish the Project purpose;
- Activities that may harm or harass migratory birds will be scheduled to the extent possible outside of the normal migratory bird breeding season (mid-April to mid-August) to ensure that nesting activity is not disturbed and that eggs and flightless young are not inadvertently harassed or destroyed. At a minimum, if complete avoidance of these activities during the specified timeframe is not feasible, nest searches will be undertaken by a qualified biologist and avoidance setbacks will be established around active nests. Nest searches will only be completed following consultation with CWS and turtle nest searches undertaken by a qualified biologist if preferential habitat is identified;
- If encountered, turtle nesting areas will not be disturbed during the late May to mid-July period;
- Existing infrastructure and previously disturbed areas (e.g., roads, mowed areas, parking areas, etc.) will be preferentially used where feasible to reduce ground disturbance;
- Machinery and equipment will be inspected to ensure no species have occupied them and maintained in good working order to limit emissions, including noise generation;
- Machinery and equipment will be cleaned prior to entering the site to limit the potential spread of exotic or invasive plant species;
- Food and food waste will be stored and disposed of properly to avoid attracting wildlife;
- On-site workers will receive training and reference material that will help them identify bird species that could be attracted to habitats created by Project operations (e.g., Common Nighthawk and Bank Swallow). If workers encounter birds that they suspect may be nesting within the Project site, a biologist will be contacted to determine whether nesting is occurring and to locate the nest. Note: nests should not be flagged since this increases the probability of predation;

- If a nest is found within Project site, an appropriate setback developed in consultation with the CWS will be established around the nest in which humans activities will be restricted until the young fledge and leave the area or until the nest naturally fails; and
- If a species at risk is encountered, contact will be made to a Species at Risk Biologist at NBDNRED at (506) 453-5873 to discuss immediate actions and future mitigation.

5.8.3.3 Characterization of Potential Interactions Following Mitigation

Development of the Project will not result in the permanent loss of wildlife habitat, given the limited area of physical disturbance associated with the Project activities; however, it may interact with wildlife through sensory disturbances such as noise, vibration, or light, or by increased traffic in the Project site. Although the Project site may provide some habitat for some wildlife species, due to its industrial nature and small footprint, the habitat offered by the Project site is not likely preferred by valued wildlife species.

Following the various phases of Construction, wildlife will be able to return to the site and some wildlife habitat temporarily lost by temporary equipment and workers rendering it unusable will return to its pre-existing state. The effects of the required drawdowns of the impoundment will only be temporary and will not have lasting effects on habitat.

AC CDC historical records indicate that one mammal SAR, the Canada lynx, has been historically observed within 5 km of the Project site. Project activities, such as the operation of heavy machinery and construction of cofferdams or concrete work, are likely to result in such sensory disturbance that most wildlife will likely avoid these areas while Project phases are taking place, thereby limiting the potential for wildlife encounters, injury, or mortality of wildlife species. However, suitable habitat in the vicinity of the Project is abundant.

Furthermore, the Project site may provide some less-than-preferential habitat for some bird species, including SAR such as the Common Nighthawk; however, impacts to these areas are expected to be negligible and no clearing of land is anticipated during the Project. Field studies for breeding birds identified a total of 51 bird species comprised of 262 individuals, including two SAR (Bald Eagle and Common Nighthawk); however, the Project site is not likely to offer preferred habitat for either species. There were no other SOCC species identified.

Additionally, the Project is situated in a larger surrounding area that offers ample natural habitat, such as forests and clearings as well as residential properties.

Project activities are likely to result in such sensory disturbance to birds and thus most bird species are likely to avoid the areas during each phase of work, thereby limiting the potential for injury or mortality of bird species.

Acoustic surveys for bats identified the potential presence of little brown bat (listed as Endangered under SARA) and big brown bat (a secure species) in the area; however, the Project site itself is not likely to provide suitable nesting habitat. This is also the case for any potential wood turtles or snapping turtles in the area.

Given the relatively limited area of disturbance associated with the Project, the environmental setting, past use of the Project footprint, and implementation of the mitigation measures outlined in **Section 5.8.3.2**, substantive interactions between the Project and wildlife and wildlife habitat are not anticipated.

Following the completion of all the phases of the Project, the site will be back to its pre-existing conditions with no lasting effects from the work.

5.8.4 Summary

Assuming the proper and adequate application of the mitigation measures described above, including conducting intrusive Project activities outside of the ECCC-recommended timing window for the Project location to facilitate compliance with the MBCA, the potential interactions between the Project and wildlife and wildlife habitat are not expected to be substantive.

5.9 Socioeconomic Environment

The potential interactions between the Project and the socioeconomic environment are assessed in this section.

5.9.1 Scope of VC

The Project has the potential to interact with the socioeconomic environment, which includes land and resource use, employment, and the local economy. These potential interactions concern regulatory agencies, non-governmental organizations, and the general public because they can have a direct influence on the lives of those living and working in the vicinity of a project. The socioeconomic environment has therefore been selected as a valued component (VC) in recognition of these concerns and values of New Brunswickers.

The main components of the socioeconomic environment, in relation to this assessment, are defined as follows:

- **Land and Resource Use** refers to current and future uses of public and private land and resources. It includes uses such as industrial, commercial, and residential use, property ownership (including potential nuisance effects), and the use of land and resources for recreational purposes (other than by Indigenous peoples, which uses are addressed under **Section 5.11**, Traditional Land and Resource Use), among others; and
- **Employment and Economy** refers to the labour market and availability, employment, employment income, business income, and their aggregate influence on the local, regional, and provincial economies.

The scope of the socioeconomic environment VC normally includes potential interactions of the Project with residential, agricultural, forestry, recreation, and transportation land uses; and the employment and economic conditions that may change as a result of the Project. However, the Project phases and activities described in **Section 2.3** of this EIA Registration document provide limited potential for interactions with the socioeconomic context of the area, particularly due to its rural setting and sparse local population.

The scope of this VC is therefore focused on the potential (but limited) interactions of the Project phases and activities with residential, recreational, and transportation land uses as well as limited interactions with economy and employment.

The scope of the assessment is based on applicable regulations and policies, anticipated issues and concerns, existing knowledge of the area, and anticipated potential interactions.

The local assessment area (LAA) for the socioeconomic environment is defined as the Bathurst Parish Census Subdivision from Statistics Canada, which encompasses the rural community of Bathurst Mines and the Station.

5.9.2 Existing Conditions

The socioeconomic setting of the Project site is described at a high level in **Section 3.3** of this EIA Registration document. Further information on socioeconomic conditions specific to potential interactions with the Project site are described in the sections below:

5.9.2.1 Demographic Overview

Detailed demographic information was not available for the rural community of Bathurst Mines, since the area is included in the larger Bathurst Parish Census Subdivision. The Bathurst Parish Census Subdivision had a population of 4,797 as of the 2016 Census (Statistics Canada 2017), the most recent Census for which data are currently available. The population of the area decreased by 3.7% between the 2011 and 2016 Census. With a median age of 50.1, the population is generally older than the provincial median average age of 45.7 (Statistics Canada 2017).

5.9.2.2 Land and Resource Use

The Project site is located immediately south of the rural community of Bathurst Mines, in Bathurst Parish, New Brunswick. The community runs along the Nepisiguit Falls Road, with the built-up area terminating at the entrance to the Project site's built assets. There is a history of some industrial development in or near the community, including the Station itself as well as the former Brunswick Mine #6 (closed in 1983) located within approximately 2 km to the west of the Station and the former Brunswick Mine #12 (closed in 2013) located within approximately 10 km to the northwest of the Station; however, the community of Bathurst Mines now appears to consist exclusively of residential land use, with a mix of permanent homes as well as seasonal cottages.

There is recreational land use in the vicinity of the Project site as evidenced by the recreational all-terrain vehicle (ATV) trail that encompasses the former rail bed adjacent to the Station. It can also be assumed that recreational and traditional hunting and fishing occur in the area, given the rural forested character of the area. The presence of large swaths of provincial Crown land in the vicinity of the Station indicate the potential for seasonal dwellings (camp lots) and forestry use leases.

5.9.2.3 Local Government Structure

Bathurst Mines is within the Local Service District (LSD) of Bathurst Parish. LSDs do not hold governing authority under the New Brunswick *Community Planning Act*, but rather receive mandated services from Regional Service Commissions (RSCs) under the *Regional Service Delivery Act*. A representative of the Bathurst Parish Local Service District sits on the Commission to ensure the interests of the area are considered.

The Local Service District of Bathurst Parish is within the service boundary of the Chaleur Regional Service Commission (RSC #3). The Chaleur Regional Service Commission provides residents of Bathurst Mines with land use planning, solid waste management, and sports and recreation services.

5.9.2.4 Residential Land Use

Residential land use is the most dominant land use in the area. Apart from the Station itself, the community of Bathurst Mines today appears to be entirely composted of single unit dwellings and associated accessory structures, although there is a long history of mining activity in the area. These dwellings appear to be serviced by on-site wells and septic systems.

The presence of on-site services indicates any recent or future development in Bathurst Mines require a minimum lot size of 0.4 ha (1 acre), allowing for the assumption that development will continue the established rural pattern.

5.9.2.5 Recreational Land Use

There is evidence of passive recreational land use such as hunting, fishing, and hiking trails. There is an active all-terrain vehicle (ATV) and snowmobile trail that runs along the former railway adjacent to the Station, from the city of Bathurst to Bathurst Mines.

The Project site is located within Zone 5 of the Province of New Brunswick Wildlife Management Zones (WMZ). WMZs provide regulations for hunting, trapping, and snaring and parameters with respect to the open and closing of seasons and acceptable distances from land uses.

5.9.2.6 Resource Land Use

There is a history of forestry uses in the general area, specifically provincial Crown land leases for cutting and harvesting trees. The immediate area is located within the Bathurst Mining Camp mineral deposit, a significant deposit of base metal minerals which has been a significant draw for mining and resource extraction developments over the past century.

Two significant mining operations, Brunswick Mine #6 (closed in 1983) and Brunswick Mine #12 (closed in 2013), are located approximately 2 km and 10 km from the Project site, respectively. The region as a whole continues to see significant mineral exploration activity, and could see future mining and extraction operations.

5.9.2.7 Transportation Land Use

Nepisiguit Falls Road is accessed from Routes 430 and 360. Nepisiguit Falls Road is considered a low volume road as it services a small number of private lands. A low volume road is typically not constructed to withstand high volumes of personal vehicle or truck traffic (GNB 2012).

5.9.2.8 Employment and Economic Activity

Economic activity is limited in the immediate vicinity of the Project site. Employment in the area is generally concentrated in the nearby city of Bathurst with employment in the retail trade, construction, health care, accommodation, and food services sectors being the most represented. Economic drivers are, therefore, closely tied to the provision of services for area residents. The mining sector was once a significant employer in the area.

Although there remains only one active mine in the area (the Caribou Mine, located approximately 40 km northwest of the Station), Bathurst Mines and the surrounding region remain a target for future mineral exploration and extraction.

5.9.3 Assessment of Potential Interactions between the Project and the Socioeconomic Environment

Without mitigation, the mechanisms by which the Project could interact with the socioeconomic environment are discussed below.

5.9.3.1 Potential Interactions

Interactions with Residential Land Use

The Project construction activities have the potential to interact with nearby residences, the nearest of which is approximately 150 m away, on Nepisiguit Falls Road. Potential Project interactions include light and noise disruption combined with a nominal increase in vehicle traffic during peak activity at the Project site. These interactions are expected to be limited, given the relatively limited scale of the Project phases and activities as well as the fact that these activities will be spread out over a period of approximately eight years, thereby minimizing their intensity and extent. Noise levels from activity and traffic are not expected to be substantive or intrusive to the nearby residences. Any intrusive noise-producing activities that may impact the residents of Nepisiguit Falls Road will be carried out between 7:00 a.m. and 7:00 p.m., Monday to Saturday and excluding holidays, to the extent possible.

Interactions with Other Land Uses

The Project site is not anticipated to have measurable interactions with Recreational Land Use, Resource Land Use, or Transportation Land Use.

Interactions with Employment and Economy

The Project phases and activities will generate some limited employment income for contractors and firms providing goods and services to accomplish those activities, with corresponding economic activity in the region from goods, services, and accommodations by workers. The interactions between the Project and Employment and Economy are relatively modest and are not discussed further.

5.9.3.2 Mitigation

Mitigation measures or best management practices to reduce potential environmental effects as a result of interaction between the Project and the socioeconomic environment are identified below.

Residential Land Use

- NB Power has been and will continue to engage with local residents prior to and throughout the Project to identify and consider concerns;
- Vehicles and equipment will be equipped with mufflers and maintained, and dust suppression will be applied to stockpiled soil during dry periods; and
- Working hours for intrusive noise-producing activities will conform to a 7:00 a.m. to 7:00 p.m., Monday to Saturday (excluding holidays) schedule, to the extent possible. Activities that do not generate intrusive noise or light (e.g., work within the powerhouse) may nonetheless be conducted at any time. Should work be completed during dark conditions, directional lighting will be used on-site with a downward lateral focus to minimize light leaving the site.

5.9.3.3 Characterization of Potential Interactions Following Mitigation

The Project site may result in limited and temporary interactions with nearby Residential Land Use on Nepisiguit Falls Road. This may include dust from increased traffic along the local road, as well as increased noise and light associated with work at the Project site. Given the distance of the Project site to nearby residences and the nature of the planned activities, limiting noise-producing work to 7:00 a.m. to 7:00 p.m., Monday to Saturday and excluding holidays, and avoiding intrusive activities during the evening, overnight, weekends, and holidays, will sufficiently mitigate interactions with the socioeconomic environment.

The general area surrounding the Project site, including the rural community of Bathurst Mines, has a limited variety of land use as is typical of a rural development pattern. It is also important to note that the immediate area and region as a whole has a strong connection to, and history of, resource extraction and mining activities. Although not directly linked, the consequences and impacts from the area's former mining operations, including resulting truck traffic, would not have been significantly different from truck traffic resulting from this Project on the local area. The area's history with resource extraction may suggest the region is generally tolerant of activities related to heavy industry, including construction and trucking activities.

As local residences must travel to access employment, social, and commercial services, the local socioeconomic conditions are dependent on access to Nepisiguit Falls Road. Proposed work at the Project site is not expected to affect access to, or use of, Nepisiguit Falls Road and therefore no substantive impacts to the socioeconomic environment are expected.

No specific follow-up or monitoring is required or proposed for the socioeconomic environment.

5.9.4 Summary

The proposed work at the Project site does not result in a change of land use or impact the existing land use at or surrounding the site. It is anticipated that activities at the Project site may create temporary, short-term nuisance to some nearby residences in Bathurst Mines. This may include increased traffic along Nepisiguit Falls Road. Work at the Project site may also create a temporary increase in noise and light.

These possible interactions are limited and temporary and may be mitigated by scheduling intrusive activities to occur between 7:00 a.m. to 7:00 p.m., Monday to Friday and excluding holidays, and avoiding intrusive activities during the evening, overnight, weekends, and holidays. Overall, the potential interactions between the Project site and the socioeconomic setting are not expected to be substantive.

5.10 Heritage Resources

The potential environmental interactions between the Project and heritage resources are assessed in this section.

5.10.1 Scope of VC

Heritage resources, both naturally occurring and human-made, are those resources related to the past that remain to inform present and future societies of that past. Heritage resources includes archaeological resources (e.g., artifacts, features, structures), palaeontological resources (e.g., fossils), and built heritage resources (e.g., historic buildings, complexes). Heritage resources are highly delicate features of the environment and their integrity is susceptible to ground-disturbing activities. A Project activity related to surface or sub-surface ground disturbance has the potential for interaction with heritage resources, where they are present.

Heritage resources has been selected as a valued component (VC) because of its importance to the people of New Brunswick and because these resources are recognized and managed by provincial and federal regulatory agencies. In addition, Indigenous peoples are very interested in the preservation and management of heritage resources, particularly those resources that relate to their individual identities as well as their community history, culture, or traditions. Importantly, the Project is located on the shores of and within the Nepisiguit River, which, like with all major watercourses, increases the potential for harbouring heritage resources (especially archaeological resources) since these waterways have been historically used by Indigenous peoples as “highways” of the past.

Natural waterfalls also have potential to harbour heritage resources because they tend to be (or have been) important gathering places for Indigenous peoples to fish, develop seasonal or permanent encampments, and practice cultural and spiritual activities.

Heritage resources in New Brunswick are protected under the New Brunswick *Heritage Conservation Act*, which is administered by the Archaeology and Heritage Branch (AHB) of the New Brunswick Department of Tourism, Heritage and Culture (NBDTHC), and are considered to be very important and highly valued by the people of New Brunswick (GNB 2020). The *Heritage Conservation Act* outlines the Province's ownership of all archaeological, palaeontological, and burial site heritage objects (GNB 2020). Any such objects determined to be of Indigenous origin are specifically held "in trust" by the Government of New Brunswick on behalf of Indigenous people and their communities (GNB 2020). The Act also protects locally or provincially designated heritage places.

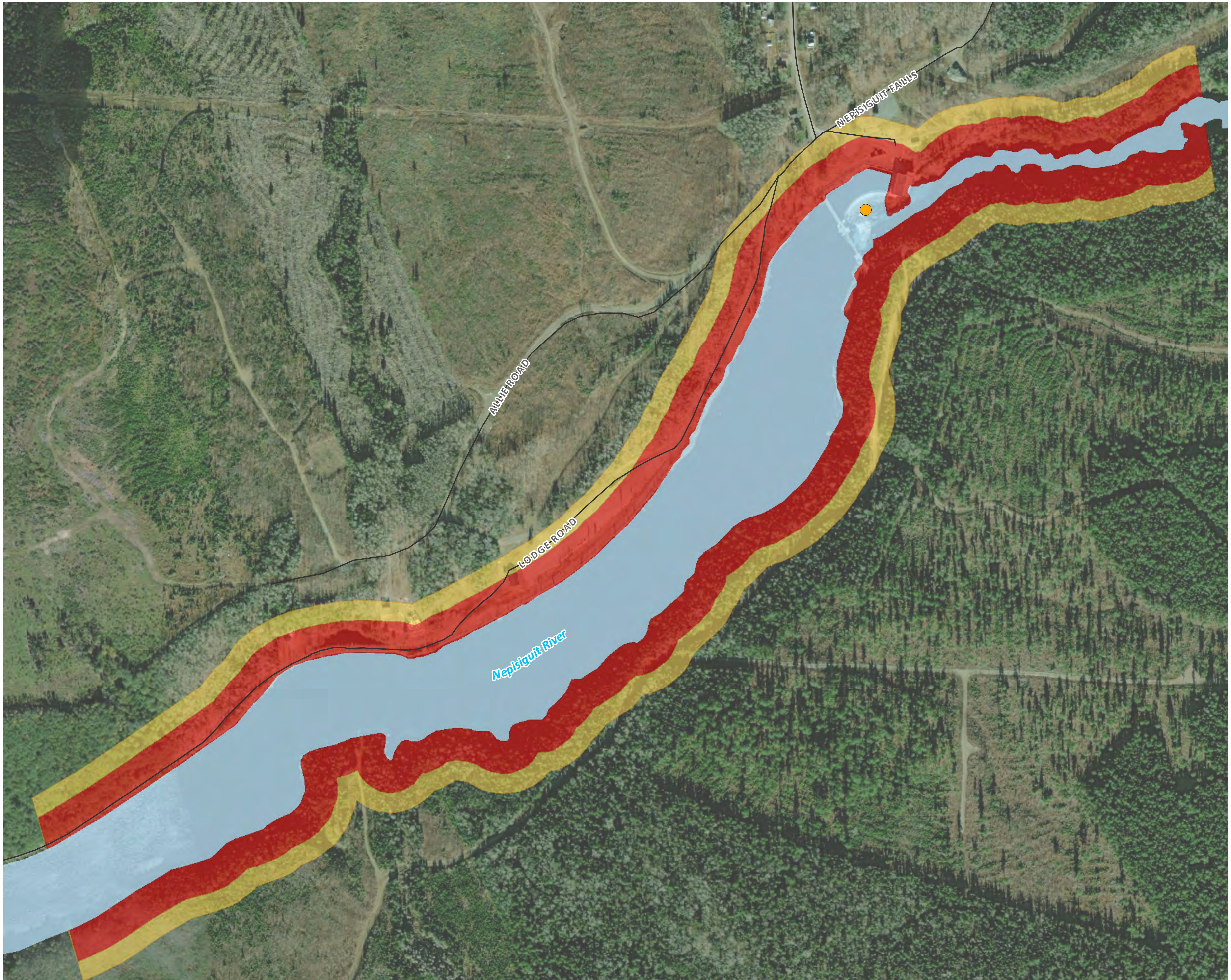
The following definitions for selected heritage resources are derived from the provincial *Heritage Conservation Act*:

- **Archaeological Object:** "*an object which shows evidence of manufacture, alteration or use by humans that may provide information about past human activities and which meets any criteria set by regulation, and includes a sample collected from that object*".
- **Archaeological Site:** "*a place where evidence of past human activities, such as archaeological objects and features, is discovered on, buried or partially buried beneath the land, or submerged or partially submerged beneath the surface of a watercourse or permanent body of water*".
- **Burial Ground:** *"a place that has been used for the placement of human remains or burial objects, but does not include a cemetery regulated under the Cemetery Companies Act".*
- **Burial Object:** *"an object that is directly associated with the interment of a human, but does not include human remains".*
- **Palaeontological Object:** *"a work of nature consisting of or containing any remains, trace or imprint of a multicellular plant or animal or a stromatolite preserved in the Earth's crust since some past geologic time; does not include human remains".*
- **Palaeontological Site:** "*a place where evidence of palaeontological objects is discovered in rock or unconsolidated sediment, exposed at the surface, buried or partially buried beneath the land, or submerged or partially submerged beneath the surface of a watercourse or permanent body of water".*

Archaeological resources (i.e., burial objects or archaeological objects) tend to be found in surficial soils (normally in the layers above bedrock or glacial till), whereas palaeontological objects (i.e., fossils) tend to be found in certain types of bedrock that are conducive to fossil formation (e.g., sedimentary rock). The discovery of these resources can provide valuable information about the history of human activity or use in the distant past (in the case of archaeological objects), or natural history and evolution of wildlife and vegetation in earlier eras (in the case of palaeontological objects).

The Province of New Brunswick provides guidance for conducting heritage assessments under its "Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick" (Archaeological Services 2012).

For heritage resources, the local assessment area (LAA) is defined as the 80 m of riparian area along the existing edge of the impoundment area within approximately 500 m upstream of the Station (refer to **Figure 5.10.1**).



NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

LOCAL AREA ASSESSMENT FOR HERITAGE RESOURCES

FIGURE 5.10.1

- Nepisiguit Falls Generating Station
- Road
- Waterbody
- Local Assessment Area: Heritage Resource Lower Potential
- Local Assessment Area: Heritage Resource High Potential

0 37.5 75 150 m

SCALE 1:5,750

N S W E

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-10-01

5.10.2 Existing Conditions

Existing conditions with respect to the overall historical context of the Station site, as well as, for archaeological resources, palaeontological resources, and built heritage resources, are discussed in this section.

5.10.2.1 Historical Background

Based on a review of available literature, the following is a high-level summary of important historical information about Nepisiguit Falls, the NB Power property associated with the Station, and the surrounding lands (refer to **Figure 2.1.1** above).

The Nepisiguit River was used as a primary mode of transportation and means of sustenance for Indigenous peoples, particularly the Mi'kmaq peoples who have occupied the lands in certain parts of New Brunswick for several millennia. The nearby Pabineau First Nation (Oinpegitjoig L'Noeigati) has expressed that the Nepisiguit River is an important part of their culture and their practice of traditional activities. The Nepisiguit Falls are known traditionally as E-go-mog-oa-seg, and were formerly known as the Great Falls or Grand Falls.

The Nepisiguit Mi'gmaq Trail, which is partly located within the LAA, is thousands of years old and was used to access tribal hunting, fishing, trapping, and gathering sites and as a thoroughfare by the Mi'kmaq peoples and other First Nations for accessing other New Brunswick watersheds for trading (NMTP 2020). Based on this longstanding use and present day cultural importance, the trail and lands along the Nepisiguit River are considered to be rich in cultural heritage and therefore have a high potential to harbour undiscovered archaeological objects and/or sites (NMTP 2020).

The earliest European to visit the area was Jacques Cartier in 1534, and the earliest European settlers of the area included French settlers (*circa* 1619), followed by Acadian refugees (*circa* 1755), and later by British settlers (*circa* 1768) (NMTP 2020).

During the 19th Century, the local economy was based on shipbuilding, logging, and sawmills near Bathurst (which was a regional trade hub) and on farming and fishing in the outlying rural communities (Glendenning and Dale 2019).

The Nepisiguit River has been an important recreational fishing location since at least the mid-1800s, sometimes visited by European tourists specifically for its sport fishing (White 1871). Historical records indicate that the Nepisiguit River was a biologically productive system which was an important means of sustenance for Indigenous people, and the lower reaches of the river were prime habitat for Atlantic salmon and other salmonids which were fished in large numbers (White 1871). White (1871) noted that the Nepisiguit (Grand) Falls act as a natural barrier and impedes fish passage to upstream habitats; however, he noted that there were great quantities of brown trout above the Nepisiguit Falls (White 1871).

The Bathurst Mines area has been the site of industrial development since the early 1900s. Bathurst Iron Mines operated in the area from 1907 to 1913. Following this, the pulp and paper industry began to dominate the regional economy in the early to mid-1900s with development of pulp and paper mills in Dalhousie, Bathurst, and Miramichi. By the 1960s, base metal mining had become the focus of the local and regional economy as several base metal deposits were discovered in the area and brought to commercialization (Glendenning and Dale 2019).

The Bathurst Lumber Company completed construction of the Station in 1921 (O'Connell n.d.) to provide power to a Bathurst pulp and paper mill owned by the Bathurst Power and Paper Company. To support the mill's expansion, the Station's first two generating units were commissioned in 1921 by Morrow and Beatty Limited of Peterborough, Ontario (O'Connell n.d.) and the addition of a third unit was completed in 1929.

In 1968, operation of the pulp and paper mill in Bathurst was taken over by Consolidated-Bathurst Ltd.; it operated under this name and ownership until Smurfit-Stone purchased it in 1989. The Bathurst pulp and paper mill was a centerfold for the community and employed hundreds of people for almost a century (Glendenning and Dale 2019). Approximately 270 people were employed at the mill when Smurfit-Stone ceased its operations in 2005 (CBC 2007).

NB Power purchased the Station from Smurfit-Stone in 2007. The former pulp and paper mill was not included as part of NB Power's purchase. The Station was renamed the Nepisiguit Falls Generating Station to avoid confusion with the Grand Falls Generating Station on the Saint John River, also owned by NB Power.

The purchase was finalized in 2008, and NB Power has continued to maintain and upgrade the operating equipment to current safety and operational standards, including a partial refurbishment of some Station components in 2012.

5.10.2.2 Characterization of Archaeological Resources

<u>**Context and Methods for Archaeological Impact Assessment (AIA)**</u>

The AIA conducted for the Project was focused on the LAA (previously defined). It should be noted that the survey also included the alignment of the recently constructed new bypass road (approximately 250 m in length) prior to its construction.

The "Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick" (Archaeological Services 2012) consider the first 50 m away from a watercourse as well as 100 m from the confluence of watercourses to be of high archaeological potential; the next 30 m (from 51 m to 80 m from the watercourse) is considered to be of medium archaeological potential, and all other areas are generally considered to be of low archaeological potential (Archaeological Services 2012). Together, areas of high and medium archaeological potential are sometimes termed "elevated archaeological potential", for brevity. Under these guidelines, a systematic AIA acceptable to the AHB must be undertaken to confirm whether archaeological resources are likely to be present.

An AIA (preliminary investigation or walkover) was conducted on August 6, 2021 to characterize and describe the existing conditions of the Project site and the LAA. Dillon retained Cultural Resource Management Group Ltd. (CRM Group) of Bedford, Nova Scotia to conduct the AIA to support the EIA Registration. The AIA assists in the assessment of the potential Project-related interactions with heritage resources, especially given the Station's proximity to a major watercourse (i.e., the Nepisiguit River).

An AIA consists of two components. The first component is the completion of a preliminary investigation to determine the potential for heritage resources to be affected by a particular development or project using desktop research, consultation with knowledgeable locals and groups, and a site walkover. This informs the second component of the AIA, which is the development and implementation of a subsequent systematic field evaluation in areas confirmed by the site walkover to be of high and medium archaeological potential, in order to confirm the presence of potential heritage resources in the Project site and LAA. A systematic field evaluation generally consists of subsurface shovel testing prior to ground disturbance or archaeological monitoring during earth moving activities.

The findings from these two components, in turn, help to inform the development and implementation of mitigation measures designed to protect any heritage resources that might be present.

Archaeological Impact Assessment: Preliminary Investigation Methods

The preliminary investigation begins with preparing an Archaeological Field Research Permit (AFRP) application, completing a desktop assessment (i.e., documentary research), consultation/engagement with local individuals and/or groups), and a site walkover (conducted on August 6, 2021 by the CRM Group). Upon application for, and successful receipt of, an AFRP, the AIA can then begin.

Archaeology Field Research Permit (AFRP) Application and Desktop Assessment

CRM Group obtained an AFRP (Permit Number 2021NB64 issued to CRM Group Staff Archaeologist Robert Shears) which permitted the AIA preliminary investigation and site walkover to be conducted. For the application process, CRM Group requested the most recent Archaeological Predictive Model/Recorded Sites Mapping of the Project site from AHB. This documentation must then be included as part of the AFRP application.

After receiving the model/mapping from the AHB, a robust desktop assessment was initiated to gather historical and environmental information that will contribute to the identification of archaeological potential within the Project site and to provide a historical and cultural context to evaluate the significance of any archaeological resources (CRM Group 2021).

The desktop assessment included a review of relevant databases and sources to the Project site and these included (CRM Group 2021):

- AHB records (including the New Brunswick Archaeological Site File, the Borden Map File, and the Archaeological Projects Manuscripts);
- Legal land grant records;
- Digital scans of historic aerial photographs of the general area of the Project acquired from the Department of Natural Resources and Energy Development's Library;
- Previous archaeological assessments; and

- Relevant published and unpublished reports of local and regional history/ecology, heritage investigations or surveys within or adjacent to the Project site.

Consultation and Engagement with Local Individuals and/or Groups

Consultation and engagement with knowledgeable local residents is intended to gather information on the location, distribution and significance of reported and unreported heritage resources. Groups to be contacted include organizations, historical societies, collectors, and specialists having local or regional expertise in the history, geology, and archaeology of the general area of the Project. This consultation and engagement includes contacting and conducting interviews with provincial archivists (CRM Group 2021). Specifically for this Project, CRM Group consulted with archivists from the New Brunswick Provincial Archives, but the names of the individuals have been withheld from this document for privacy reasons.

Site Walkover

A walkover of the areas of the interest at the Project site (specifically the area of the new bypass road and the LAA consisting of an 80 m area on both sides of the impoundment, up to 500 m upstream of the Station) was conducted on August 6, 2021 by CRM Group to provide first-hand exposure to the topography and geographical setting of the LAA. This exposure facilitated the development of a systematic field evaluation and testing strategy to complete the AIA. During the site walkover, archaeologists from CRM Group examined the Project site for potential resources identified during the desktop assessment, background research, and local engagement. The site walkover was recorded using field notes, global positioning system (GPS) coordinates and track logs, and photographs (CRM Group 2021). It is noted that CRM Group offered local First Nations (i.e., MTI and Pabineau First Nation) the opportunity to participate in the site walkover, but such participation could not be coordinated in a timely manner.

Archaeological Impact Assessment Results: Preliminary Investigation

Overall, the LAA and Project site are considered to have a generally elevated potential to harbour archaeological resources.

The LAA and Project site are in close proximity to a major watercourse, the topography associated with the waterfall at Nepisiguit Falls is significant, and there may be significant archaeological history of Pre-Contact human use, as well as the history of contemporary human use and development.

As noted in the AIA report for the preliminary investigation at the Project site (CRM Group 2021, approved by AHB on September 27, 2021), there are areas of high and medium archaeological potential on the northern side of the LAA, within 0 to 50 m and 50 to 80 m, respectively, of the Nepisiguit River. Within the northern portion of the Project site, the gentle slope along the riverbank and broad, level plateaus in the surrounding area provide easy access to the water for exiting and re-entering at either end of a portage around the falls and thus the northern side of the river was confirmed in the field as having elevated archaeological potential. There are also plenty of locations suitable for camping within the LAA and greater region near the Nepisiguit River, noting that the river contains a variable slope which has been impacted by railway and road construction. Given the confirmed elevated archaeological potential of the northern shore of the river, CRM Group recommended that any areas where surface soils will be disturbed by Project activities should first undergo a systematic field evaluation (i.e., archaeological monitoring or shovel testing) to confirm that archaeological resources are not present there. The river bed of the Nepisiguit River itself also has a high potential contain archaeological resources, and those resources (if they are present) could be exposed from dewatering activities.

Due to steepness of slope and inaccessibility to the water along the riverbank, the southern side of the river contains a generally low potential to harbour archaeological resources. A moderate to steep slope spans the length of the south side of the Nepisiguit River in the LAA and includes the location of the existing floating boom. An exception to this is within the southern portion of the LAA which includes the route of the suspected Pre-Contact portage route that extends through the central portion of the LAA and ends at a gently sloped and sheltered cove along the river. Due to its topographical features with easy access to the water and its likely use as a portage route, this cove and portage route corridor is ascribed high archaeological potential for encountering Pre-Contact[3] and Historic[4] Mi'kmaq archaeological resources (CRM Group 2021). Should any surface soils in this area be disturbed by Project activities, a systematic field evaluation (shovel testing) should be conducted in those areas prior to any such disturbance.

It is noted that the site walkover included the area of the recently built bypass road prior to its construction. It was confirmed that the area of the bypass road was ascribed to be of low archaeological potential due to the gentle slope and the modern nature of any cultural material related to the 20th Century residential property it occupies as well as its location largely outside 80 m of the watercourse (CRM Group 2021).

5.10.2.3 Characterization of Palaeontological Resources

Given there is limited ground disturbance anticipated for Project-related activities, interactions with palaeontological resources are not likely to occur. In addition, the Project site is anticipated to have a low potential for palaeontological resources due to the recent geological history of the area and the nature of the bedrock in the area that is not usually conducive to fossil presence (i.e., no sedimentary rock is present in the area). The soil within the Project site and LAA is comprised of glacial till derived from the underlying bedrock that was deposited by Late Wisconsinan ice or with minor reworking by water (Burrell and Anderson 1991). Following deglaciation, marine transgression in northeast New Brunswick reached as far inland as 79 m amsl and would have included an inland bay that reached the base of Nepisiguit Falls; however, there is no recorded Palaeo Period human occupation in the area (CRM Group 2021). Palaeontological resources are thus not discussed further in this assessment.

[3] The Pre-Contact period is defined as the time and events of Indigenous society that occurred prior to contact with non-Indigenous cultures, which began here around *ca.* 1500 current era (CE). The Contact period is the era between *ca.* 1500 and 1604 CE, when Indigenous and non-Indigenous cultures were first contacting one another intermittently across the region, which is largely unrecorded except in oral history and the archaeological record.
[4] The Historic period is defined as the time and events that occurred following settlement of the region by non-Indigenous people, beginning in 1604 CE. Its end point is not specifically defined and is constantly shifting.

5.10.2.4 Characterization of Built Heritage Resources

Within the general area of the Project, while the Station's powerhouse building itself is not locally, provincially, or nationally designated as a "heritage place", it is more than 100 years old and could thus be considered a built heritage resource. No physical changes to the building that would affect its heritage value are anticipated for the Project. An opening in one of the building walls for a garage door will be required to enable the old units to be removed from the building and the new units to be installed. The garage door installation is considered to a minor modification that should not materially affect the overall appearance or heritage value of the building.

5.10.3 Assessment of Potential Interactions between the Project and Heritage Resources

This section details the assessment of the potential interactions between the Project and heritage resources.

5.10.3.1 Potential Interactions

The preliminary results of the preliminary investigation portion of the AIA indicated that there is a high to medium potential for heritage resources to be located on the northern side of the LAA within 80 m of the Nepisiguit River and within the river itself. There is the potential for encountering unanticipated archaeological resources during the Project activities (i.e., excavations, water drawdown, and other soil disturbances) and the potential interactions between the Project and heritage resources are anticipated to arise from all Project-related activities involving ground disturbance. While there is no earth moving or ground disturbance associated with the turbine-generator unit replacements or structural repairs, some areas at the Project site may be used as equipment laydown areas, though most of these areas already consist of gravel and are already disturbed. In addition, the forebay bridge replacement (if selected) would require a small excavation to build a concrete abutment to the bridge on the northern shore of the Nepisiguit River (note: no such disturbance is required if the forebay bridge is repaired rather than replaced), and the short access road leading to the forebay bridge may be graded and levelled somewhat to reduce the steep grade of this road. A systematic field evaluation (archaeological monitoring or shovel testing) will be conducted in the bridge abutment and bridge access road areas prior to disturbing surface soils.

Finally, though the bladder replacements will not involve the movement of *in situ* soils at the Station, gravel or rockfill material brought to the site from approved borrow sources may contain previously unknown archaeological objects.

A construction laydown area will be required and will be located in the vicinity of the existing parking lot area that has already been disturbed, which is within 80 m of the watercourse. During the August 6, 2021 site walkover, the parking lot area was confirmed as being of high potential for archaeological resources. Most of the laydown areas are already disturbed, but any small undeveloped areas that require disturbance (e.g., vegetation management, construction of gravel pads) would also be subjected to shovel testing or archaeological monitoring to determine if any archaeological objects are present in that area.

5.10.3.2 Mitigation

Key mitigation measures to minimize the potential for the discovery of a heritage resource include conducting an AIA preliminary investigation and, if required, systematic field evaluation to confirm preliminary investigation conclusions regarding heritage resources. If heritage resources are discovered through the completion of the AIA, further mitigation including additional testing, archaeological monitoring during the construction activities in the vicinity of the finding, archaeological excavation or other measures would be considered. Appropriate strategies would be developed by CRM Group in consultation with AHB staff and reflect provincial and First Nations heritage resource protection priorities. Additionally, contingency and emergency response procedures in the event of the accidental discovery of a heritage resource will be developed and implemented.

The following mitigation measures, through careful design and planning, are recommended to avoid or reduce the potential for adverse interactions with heritage resources:

- Minimize the extent of disturbance of the Project site by planning as small a disturbance area as possible;
- Planned avoidance of known areas of elevated archaeological potential, to the extent practical;
- Undertake an AIA of areas proposed for ground breaking and/or earth moving including an appropriate systematic field evaluation (archaeological monitoring or shovel testing) as appropriate to identify archaeological resources that might be present;
- For any areas where shovel testing is recommended, following the archaeological guidelines and implement this work as per AHB Guidelines (Archaeological Services 2012);
- Obtaining a Site Alteration Permit for any disturbance within 100 m of a registered archaeological site, or areas that are confirmed through archaeological monitoring or shovel testing to contain archaeological resources that cannot be avoided by the Project, and following the recommendations from AHB in these areas;
- Implement archaeological construction monitoring (including observation by an Indigenous monitor, if so desired by First Nations) for any ground breaking or earth moving activities where shovel testing is not possible;
- Conduct archaeological monitoring and examination of all soil material removed from the Nepisiguit River for any artifacts that may have been deposited in the river after eroding from the shoreline areas; and
- Contingency and emergency response procedures will be developed and implemented.

If any archaeological resources are accidentally identified at any point over the course of the Project, the following mitigation measures will be employed:

- Work in the area must cease immediately and the area secured;
- AHB must be contacted at (506) 453-2738 for further direction;

DILLON CONSULTING

- Until a qualified archaeologist arrives at the site, no one shall disturb, move or re-bury any uncovered archaeological object; and
- Activities at the site may resume only when authorized by AHB and once mitigation measures have been completed.

Other contingency and emergency response procedures to be implemented in response to the accidental discovery of heritage resources will be documented and implemented as part of the Project. In addition to the above and in the event that evidence of burials or human remains are encountered:

- Contact and Inform the Lead Police Agency (RCMP or municipal police force) in accordance with AHB Guidelines (Archaeological Services 2012, pg. 57).

5.10.3.3 Characterization of Potential Interactions Following Mitigation

There are a variety of potential Project and heritage resource interactions that may persist beyond the implementation of proposed mitigation measures. These include the modification of a wall of the powerhouse building (potentially considered to be a built heritage resource) and the potential for discovering previously undiscovered (or unknown) archaeological objects. Archaeological resources could be found in the surficial soils (including topsoil and overburden) or in areas dewatered during the laydown area preparation, forebay bridge replacement/repair, bladders replacement, and structural repairs associated with the Project. Any ground breaking, earth moving, or dewatering activity has the potential to uncover previously undiscovered or unknown heritage resources. Though earth moving and ground disturbance can also uncover palaeontological resources, there is limited potential to encounter palaeontological resources at this location because the nature of the bedrock of the area is not conducive to harbouring fossils. Palaeontological resources are thus not discussed further.

The Project site and the LAA, particularly the northern shore of the Nepisiguit River within 80 m of the watercourse, have an elevated potential for harbouring heritage resources due to its proximity to a major watercourse. In particular, while there is no earth moving or ground disturbance associated with the turbine-generator unit replacements or structural repairs, the forebay bridge replacement (if selected) would require a small excavation to build a concrete abutment to the bridge on the northern shore of the Nepisiguit River. In addition, the access road leading to the forebay bridge may be graded and levelled somewhat to reduce the steep grade of this road. A systematic field evaluation (archaeological monitoring or shovel testing) prior to or during Construction will be conducted in the laydown area, bridge abutment, and bridge access road areas prior to disturbing surface soils. Finally, though the bladder replacements will not involve the movement of *in situ* soils at the Station, gravel or rockfill material brought to the site from approved borrow sources may contain previously unknown archaeological objects.

A construction laydown area will be required and will be located in the vicinity of the existing parking lot area that has already been disturbed, which is within 80 m of the watercourse. During the site walkover, the parking lot area was confirmed as being of high potential for archaeological resources. Most of the laydown areas are already disturbed, but any small undeveloped areas that require disturbance would also be subjected to archaeological monitoring or shovel testing to determine if any archaeological objects are present in that area.

In summary, while there are areas of elevated archaeological potential that might be altered as part of the Project, the combination of a small area to be disturbed (if at all), completing an AIA (i.e. the preliminary investigation already completed, and the planned implementation of a systematic field evaluation), and the implementation of the other mitigation measures (i.e., archaeological monitoring and archaeological contingency and emergency response planning) will reduce the likelihood of substantive interactions between the Project and archaeological resources following the implementation of mitigation methods. Consequently, the residual interactions between the Project and heritage resources are not anticipated to be substantive.

5.10.4 Summary

Based on the AIA preliminary investigation (i.e., desktop assessment and site walkover) conducted by CRM Group, the Project site and LAA include areas that are considered to exhibit elevated potential for harbouring heritage resources, particularly archaeological and built heritage resources. However, there is a low potential for interaction between the Project and archaeological and built heritage resources because of the limited (if any) ground disturbance associated with the Project. The interactions will be associated with the preparation of the laydown areas, temporary dewatering of the Nepisiguit River for the construction of the cofferdams, and the installation of a garage door on the powerhouse building.

Earth moving and ground breaking activities have the potential to interact with archaeological resources buried in the soil or subsurface bedrock of the Project site, if they are present. However, pre-construction archaeological evaluations and surveys, and archaeological monitoring or examination during all ground breaking activities, should result in the identification of any archaeological resources, and development of appropriate mitigation in the event that any archaeological resources are present in areas identified for ground disturbing activities. Therefore, in consideration of this mitigation, the residual potential interactions between the Project and heritage resources are not expected to be substantive.

A systematic field evaluation of areas to be disturbed as part of the Project, with further mitigation defined in consultation with AHB in the event of any discovery of heritage resources, will improve the level of confidence of this prediction.

5.11 Traditional Land and Resource Use

The potential interactions between the Project and Indigenous traditional land and resource use are assessed in this section.

The information presented in this section is intended to provide a high-level overview of Indigenous traditional land and resource use in the general area of the Project site and local assessment area (LAA, defined later). This will include Indigenous traditional land and resource use along and within the Nepisiguit River and specifically those uses at, or near, the Station. The information and assessments provided below are derived from publicly-available literature and general knowledge and information relating to Indigenous traditional land and resource use in the Nepisiguit Falls and Bathurst Mines area. This information and preliminary assessment is not intended to supersede or prejudice the specific traditional land or resource use information or knowledge that may be shared as part of ongoing consultation with Indigenous communities. Rather, it is an attempt to provide information from general knowledge and secondary sources of information that is intended to complement the traditional knowledge that might become available from Indigenous people in this regard.

To date, a traditional land use and/or knowledge study has not been completed as part of the Project. However, ongoing consultation with the Pabineau First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI, an umbrella organization representing eight of the nine Mi'kmaq communities in New Brunswick) and as well as other First Nations may provide further opportunities for the First Nations to share additional traditional land and resource use information in the area, to further refine this assessment.

5.11.1 Scope of VC

Traditional land and resource use refers to the activities undertaken by Indigenous peoples that were carried out dating back to the Pre-Contact[5] period (GNB 2011). These activities may have included the building and settling of encampments, seasonal travel, hunting, fishing, trapping, gathering of food and medicines, practicing ceremonial traditions, and burial activities. Evidence of these traditional land and resource uses can generally be found in archaeological evidence (i.e., archaeological sites, burial sites, and associated objects) and through Indigenous traditional knowledge and oral histories.

Traditional land and resource use has been selected as a valued component (VC) in order to:

- Acknowledge that the lands and resources have been used, and continue to be used, for traditional purposes by Indigenous persons;
- Assess the potential interactions between Project activities and traditional land and resource use, as required under the EIA Regulation; and
- Assist NB Power (representing the Crown) in fulfilling its duty to consult with First Nation communities regarding the Project.

This section of the EIA Registration is intended to provide information about the potential interaction of Project activities on traditional land and resource use in the Project site and a LAA, and to identify appropriate mitigation measures to remove or reduce negative interactions. For the purposes of this EIA Registration document, Indigenous traditional activities practiced on Crown, publicly-owned, or certain private lands will be considered.

[5] The Pre-Contact period is defined as the time and events of Indigenous society that occurred prior to contact with non-Indigenous cultures, which began here around *ca.* 1500 current era (CE). The Contact period is the era between *ca*. 1500 and 1604 CE, when Indigenous and non-Indigenous cultures were first contacting one another intermittently across the region, which is largely unrecorded except in oral history and the archaeological record.

The Project site is defined as the Station as shown in **Figure 2.1.1**, and associated laydown areas. The LAA is defined as the Nepisiguit River and a 30 m riparian area on each side of the watercourse, extending upstream approximately 26 km to the Highway 430 crossing and downstream approximately 30 km to tidewater near the city of Bathurst (refer to **Figure 5.11.1**).

5.11.2 Existing Conditions

The Nepisiguit River has a rich history and significant cultural importance within New Brunswick, and importantly, with New Brunswick's First Nations. Based on a review of available literature, the following is a brief and high-level summary of traditional land and resource use in the LAA (refer to **Figure 5.11.1**).

It is important to note that no interviews related to the history of the LAA or the properties in or around the Station have been conducted with historical society groups or First Nations representatives for the purposes of developing this EIA Registration document, and the following information is based on literature review.

5.11.2.1 Historical Background

The LAA is part of the greater Mi'kmaq territory known as Siknikt, meaning "drainage area." Today, Siknikt includes the Miramichi River, the Acadian coast, and the Bay of Fundy region (Sable and Francis 2012; CRM Group 2021).

The Nepisiguit River, known as Winpegijawik by the Mi'kmaq (meaning "rough water"), and surrounding lands have been used and occupied by Indigenous peoples since time immemorial. Since contact with the Europeans, the Mi'kmaq people have been documented to have used and occupied this area (White 1871). The Nepisiguit River, as many others within the province of New Brunswick, was used as a primary mode of transportation by, and a means of sustenance for, Indigenous peoples, particularly the Mi'kmaq peoples who have occupied the lands in New Brunswick for several millennia.

Members of the nearby Pabineau First Nation (Oinpegitjoig L'Noeigati) have expressed that the Nepisiguit River is an important part of their culture and their practice of traditional activities. The Mi'kmaq would have used the Nepisiguit River to fish and to access hunting and trapping areas for moose and other wildlife. In addition, the Nepisiguit River banks would have been ideal areas for gathering fiddleheads as well as collecting other plants for medicinal purposes.

The Nepisiguit Falls are known traditionally as E-go-mog-oa-seg, and were formerly known as the Great Falls or Grand Falls. This area would have been an important fishing area for salmon, eels, and other anadromous fish species. The historic Nepisiguit Mi'gmaq Trail, a traditionally important trail network that is still in use today, follows the Nepisiguit River for approximately 140 km from Daly Point Nature Reserve at the Bathurst Harbour (i.e., outlet of the river) to the Bathurst Lakes camps in Mount Carleton Provincial Park. The trail is considered to be thousands of years old and would have been used to access hunting, fishing, trapping, trading and gathering sites, including those accessed during seasonal migration following the availability/seasonality of resources. The trail was also used as a thoroughfare, which the Mi'kmaq peoples traveled to trade with other First Nation communities

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

LOCAL ASSESSMENT AREA (LAA) FOR TRADITIONAL LAND AND RESOURCE USE

FIGURE 5.11.1

- Nepisiguit Falls Generating Station
- Road
- Local Assessment Area (LAA): Traditional Land and Resource Use
- Waterbody

0 1.25 2.5 5 km

SCALE 1:130,000

N W E S

MAP DRAWING INFORMATION: ESRI, DIGITALGLOBE, GEOEYE, EATHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS,AEROGRID, IGN, AND THE GIS USER COMMUNITY
DATA PROVIDED BY: DILLON CONSULTING & GEONB

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

DILLON CONSULTING

PROJECT: 20-3641

STATUS: DRAFT

DATE: 2021-10-04

Document Path: E:\Shared drives\SIM\2020\203641 - Nepisiguit Generating Station\Product\Client\F5111_LAA_TraditionalLandandResources.mxd

(NMTP 2020). Based on this longstanding use and present day cultural importance, the trail and lands along the Nepisiguit River are considered to be rich in cultural heritage and have a high potential to harbour undiscovered archaeological artifacts and/or cultural sites (NMTP 2020).

The first European settlers of the area included French settlers in *circa* 1619, followed by Acadian refugees following the deportation of Acadians in *circa* 1755 and later by British settlers in *circa* 1768 (Glendenning and Dale 2019). Shipbuilding, logging, and sawmills formed the basis of the local economy during the 19th Century, and Bathurst (known formerly as Nepisiguit) was a regional trade hub. For rural settlers, farming and fishing was the mainstay of the outlying rural communities (Glendenning and Dale 2019).

The Nepisiguit River has been an important commercial and recreational fishing location since at least the mid-1800s, sometimes visited by European tourists specifically for its sport fishing (White 1871).

Historical records indicate that the Nepisiguit River was a biologically productive system which was an important means of sustenance for Indigenous people, and was prime habitat for Atlantic salmon and other salmonids which were fished in large numbers (White 1871). It is also indicated in White (1871) that natural barriers impeded passage to upstream habitats, including the Nepisiguit (Grand) Falls.

The Nepisiguit Falls were originally called the Great Falls or Grand Falls, and prior to 1921, the Great Falls flowed through a granite canyon and dropped over 30 m into a gorge (McCarthy 1999). The Great Falls power dam and hydroelectric development began in 1919. The dam was constructed out of concrete, steel, sand and gravel and was built over a period of a year and a half by 400 people. The construction of Station was completed in 1921 and it began supplying power to the Bathurst Company Pulp and Paper Mill and the homes and businesses that surrounded it (McCarthy 1999).

5.11.2.2 First Nation Community Context

The entire province of New Brunswick is currently unceded territory and is subject to the Peace and Friendship Treaties signed by the British with the Wolastoqey (Maliseet), Mi'kmaq, and Peskotomuhkati (Passamaquoddy) Nations in 1752 and renewed in specific agreements thereafter. New Brunswick's First Nations assert Aboriginal and treaty rights through these Peace and Friendship Treaties, and those rights are protected under Section 35(1) of the *Constitution Act, 1982*. In addition, the Supreme Court of Canada has held in several important decisions that the Crown (both federal and provincial) has a duty to consult with potentially affected First Nations in respect of decisions made by the Crown that might affect these Aboriginal or treaty rights, including those that might relate to their current use of the land and resources for traditional purposes. The Province of New Brunswick has a duty to consult policy which is administered by the New Brunswick Department of Aboriginal Affairs (GNB 2011). NB Power, as a Crown corporation of the Province of New Brunswick, has been delegated the duty to consult of the Province of New Brunswick for the purpose of this Project.

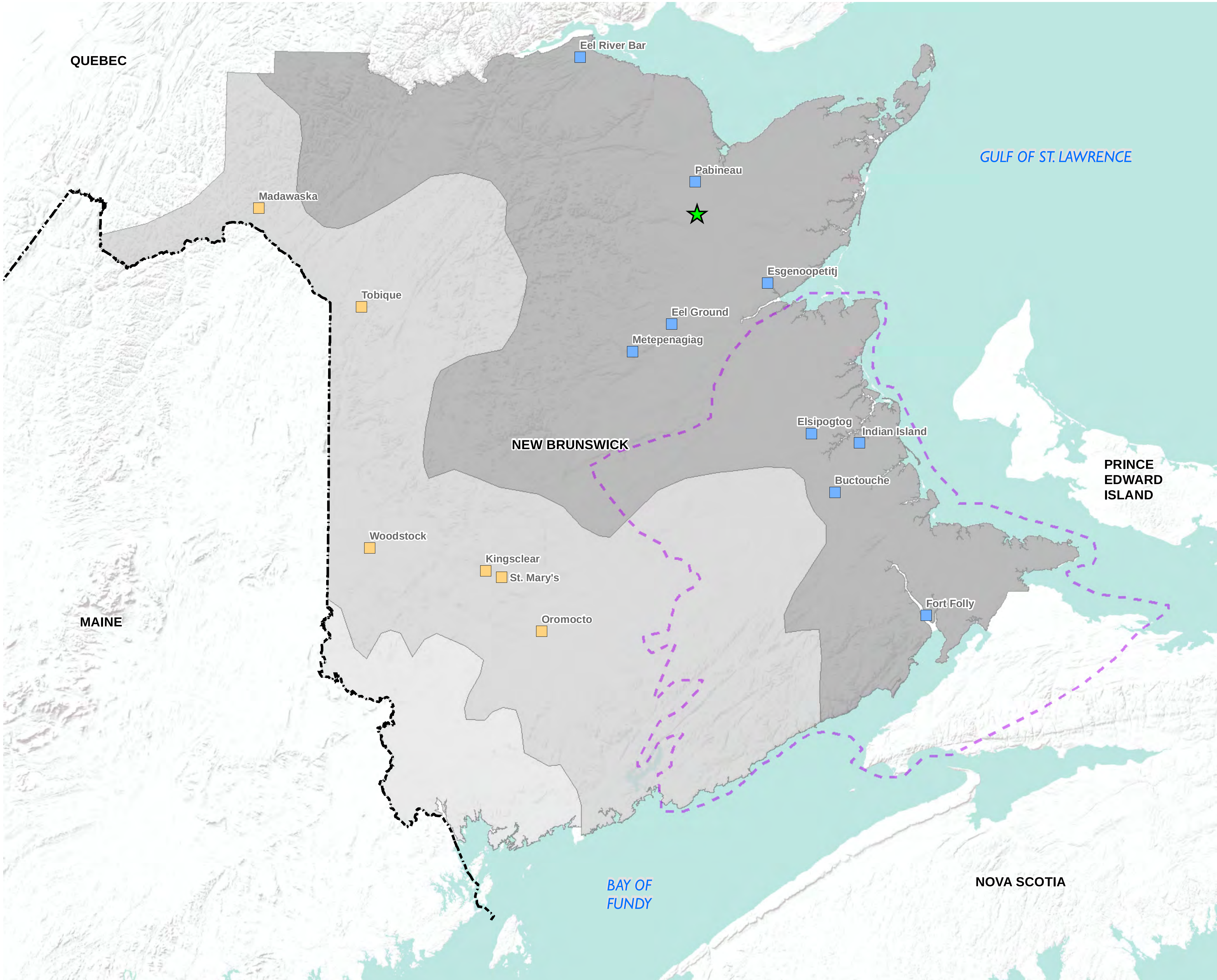
Today, there are 15 officially recognized First Nations communities within the province of New Brunswick (refer to **Figure 5.11.2**). They consist of six Wolastoqey Nation communities and nine Mi'kmaq Nation communities. Wolastoqey communities and their traditional territory are generally located along the Saint John River valley, while the Mi'kmaq communities are predominantly located

NEPISIGUIT FALLS GENERATING STATION LIFE EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

FIRST NATION COMMUNITIES IN NEW BRUNSWICK IN RELATION TO THE PROJECT

FIGURE 5.11.2



Project Location

Wolastoqey Community

Mi'kmaq Community

Elsipogtog Title Claim

Peskotomuhkati Traditional Territory

Wolastoqey Traditional Territory

Mi'kmaq Traditional Territory

20 10 0 20 Kilometres

SCALE 1:1,550,000

N W E S

MAP DRAWING INFORMATION:
SERVICE LAYER CREDITS: ESRI, USGS, NOAA
DATA PROVIDED BY: DILLON CONSULTING LIMITED, NB DEPARTMENT OF NATURAL RESOURCES, NB DEPARTMENT OF ABORIGINAL AFFAIRS, INTERNATIONAL BOUNDARY COMMISSION

MAP CREATED BY: GAM
MAP CHECKED BY: DM
MAP PROJECTION: NAD_1983 CSRS New Brunswick Stereographic

DILLON CONSULTING

PROJECT: 20-3641

DATE: 2021-10-04

along the northern and eastern coastal regions of the province. Though the Project is generally thought to be located in Mi'kmaq traditional territory, First Nations peoples migrated through the entirety of the lands in New Brunswick for millennia and as such, it is possible that other First Nations and peoples might have also used the lands and resources of this area as well. In addition, though tangential to this EIA Registration, the Peskotomuhkati Nation has begun the process of seeking formal recognition from the Government of Canada.

The LAA is likely still used by Indigenous people for traditional practices such as hunting, fishing, ceremonial, and gathering purposes. Within the Project site, hunting is not permitted and recreational fishing is restricted. It is more likely that hunting, fishing, ceremony, and gathering would also take place within other more natural areas of the larger LAA and beyond, as these areas are more forested with less restrictions for access and use. In addition, some members of Pabineau First Nation have used the multi-span bridge at the Station with permission of NB Power, to portions of their traditional territory on the southern side of the Nepisiguit River. However, this access has been limited since the forebay bridge has been closed pending replacement/repair of the bridge.

Active management of the Atlantic salmon population has been undertaken through stocking programs by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED). Furthermore, Pabineau First Nation also takes an active role in the management of salmon and have managed a salmon counting and brood stock collection fence on the Nepisiguit River since 1981 (PFN 2020). The Nepisiguit Salmon Association is also currently mandated to conserve and manage salmon populations in the Nepisiguit River, having recently released more than 80, 000 salmon fry into the Nepisiguit River in the summer of 2020 (White 2020).

An Indigenous knowledge (IK) study has not been completed for the Project; furthermore, specific and documented details on how and where traditional activities have been or are taking place may exist, but they are normally considered and held confidentially by First Nations. This knowledge and information is both valuable and private to the rights holders (land users), and as such there is an expectation that this knowledge will not and should not be freely available. As such, information presented within this section has been collected from reliable secondary sources and NB Power will attempt to confirm this information with First Nation knowledge through ongoing engagement throughout the Project. However, data collected for other field disciplines (e.g., wildlife and wildlife habitats, vegetation and wetlands, fish and fish habitat, and heritage resources) will also be used to inform the availability of land and resources that could be used for traditional purposes within the Project site and the LAA.

5.11.2.3 Indigenous Population Demographics

The 2016 Census (Statistics Canada 2017) is the latest Census available and it identified that approximately 4% of the New Brunswick population self-identifies as having an Indigenous or Aboriginal identity, or the equivalent of 29,385 persons. The total population of registered status First Nation band members in New Brunswick was 16,872, with a total of 9,960 residing on-reserve, as reported by Indigenous and Northern Affairs Canada (INAC 2021 and **Table 5.11.1**). It is noted that the totals from the Census and from Indigenous and Northern Affairs Canada may differ slightly.

Table 5.11.1: New Brunswick First Nation Total Registered Population and Registered Population On-Reserve

First Nation Community	2021 Registered Population	2021 On-reserve Population
Wolastoqey (Maliseet) First Nations in New Brunswick		
Oromocto First Nation	809	339
St. Mary's First Nation	2,030	940
Kingsclear First Nation	1,063	738
Woodstock First Nation	1,162	299
Tobique First Nation	2,577	1,593
Madawaska Maliseet First Nation	380	164
Wolastoqey First Nations Sub-total	**8,021**	**4,073**
Mi'kmaq First Nations in New Brunswick		
Eel River Bar First Nation	808	362
Pabineau First Nation	343	105
Esgenoopetitj First Nation	1,941	1,381
Metepenagiag First Nation	703	465
Eel Ground First Nation	1,078	593
Indian Island First Nation	212	112
Elsipogtog First Nation	3,505	2,742
Buctouche First Nation	122	80
Fort Folly First Nation	139	47
Mi'kmaq First Nations Sub-total	**8,851**	**5,887**
Total First Nation Population in New Brunswick	**16,872**	**9,960**

Source: INAC (2021)

The closest First Nation to the Project site is the Pabineau First Nation, which is located approximately 25 km downstream (17 km straight-line distance) northeast of the Project site.

5.11.2.4 Known Traditional Land and Resource Uses by Indigenous Persons

The current use of land and resources for traditional purposes by Indigenous persons in the LAA has not been fully documented. Further, as stated previously, no IK study has been conducted specifically to inform this EIA Registration, and literature reviews conducted did not identify any such studies conducted nearby that might inform the EIA in terms of current use of land and resources for traditional purposes. However, the Project site is located in a remote forested area in the heart of Mi'kmaq traditional territory, and it is known that the Mi'kmaq peoples have a deep cultural and spiritual connection to the Nepisiguit River, the fish it contains (particularly Atlantic salmon and American eel), and surrounding lands. It is therefore not unreasonable to suggest without evidence that the Mi'kmaq peoples have been using, and likely continue to use, the Nepisiguit River and the LAA to practice traditional activities such as hunting, trapping, fishing, gathering of food and medicines, and/or practicing ceremonial traditions. This is further supported by the limited use of the multi-span bridge at the Station by some members of Pabineau First Nation with permission from NB Power to access traditional use areas on the southern side of the Nepisiguit River, although the use of this bridge has been curtailed recently due to structural concerns until the forebay bridge can be repaired or replaced. Further engagement of the Mi'kmaq Nation and Pabineau First Nation members throughout the execution of the Project will provide further information in this regard.

5.11.3 Assessment of Potential Interactions between the Project and Traditional Land and Resource Use

The assessment of potential interaction between the Project and traditional land and resource use by Indigenous persons within the LAA is provided in this section.

5.11.3.1 Potential Interactions

In general, potential interactions between the Project and traditional land and resource use are associated with any Project activity that could result in change in the amount of land or water that would be available to Indigenous persons for practicing traditional activities that would restrict access to an area or limit an area's use for traditional practices.

Project activities associated with the bladder replacements and the forebay bridge repair/replacement may affect traditional land and resource use in the following ways.

- Access to the Project site will be temporarily restricted and controlled for safety and security purposes to prevent injury to individuals while Project activities are taking place. This restriction is anticipated to only be in place for the Project site, while the remainder of the LAA is anticipated to be available for use throughout the Project. The access restrictions to the Project site will continue until all Project activities have been completed and the final site restoration activities have been completed, at which time a determination will be made to ensure it is safe to reopen the Project site and especially the multi-span bridge for passage by Indigenous people.
- Site preparation within the Project site will be prepared with a laydown area and temporary cofferdams. The laydown area already consists of well compacted gravel that provides a stable base for the Project components, although some small areas near the existing parking lot may be covered with suitable gravel brought in from local borrow sources in order to protect the integrity of underlying soils of the Project site, potentially affecting plants and wildlife that may have been used for food, medicinal, ceremonial use, or other traditional purpose. The construction of the cofferdams will similarly cover a portion of the Nepisiguit River bed such that some limited fish habitat will be altered on a temporary basis. Outside the Project site, it is not expected that these Project activities will interact or affect plant or wildlife use for traditional purposes. It is expected that these disturbed areas will be reseeded

or vegetated as part of restoration and will naturally be repopulated over time, once the Project is completed.

- Once the Project activities are completed, the cofferdams will be removed and water levels will be returned to their pre-Project levels. However, the forebay bridge replacement/repair closure will reduce access by vehicles to the south side of the Nepisiguit River until it is complete.

Given the limited extent of the activities associated with the installation of new turbine-generator units and structural repairs, there are no interactions expected between these activities and traditional land and resource use. Those activities are therefore not discussed further.

5.11.3.2 Mitigation

It is important to note that traditional land and resource use is also connected to other VCs. The discussion of the potential interactions between the Project and other VCs (i.e. **Section 5.5** surface water; **Section 5.6** fish and fish habitat; **Section 5.7** vegetation and wetlands; **Section 5.8** wildlife and wildlife habitat; and, **Section 5.10** heritage resources), and their associated mitigation measures are applicable to this section. In addition, the following mitigation measures will be employed to avoid or reduce the potential environmental effects of the Project on traditional land and resource use within the LAA:

- Minimize the size of any areas of ground disturbance on the Project site to that which is necessary to accomplish the Project objectives while minimizing environmental disturbance to the extent possible;
- Maintain natural vegetation along watercourses and in wetlands (if present), as well as along the property boundaries, to minimize effects on natural resources and to provide a buffer for reducing effects of the Project that could cause sensory disturbance to wildlife (i.e., noise, dust);
- Conduct ongoing consultation and engagement of First Nations throughout the Project to exchange information and address question, concerns, and emerging issues during the Project;
- Carry out an IK study to determine historical and current traditional uses within the LAA and larger Nepisiguit River watershed, if so desired by Indigenous communities;
- If requested, and if the Project schedule allows, Indigenous communities or individuals will be provided the opportunity to harvest and gather species of importance within the Project Site prior to the commencement of Project activities. If possible, given the Project schedule, these harvesting and gathering opportunities should be timed to coincide with the seasonality of the species of interest;
- Engage Indigenous monitors and technicians during the biological and archaeological surveys and to monitor Project activities, if possible and if so desired by Indigenous communities;
- Avoid known or identified archaeological sites, and follow the procedure if archaeological objects are accidently encountered as well as contacting and updating First Nations;

- Fish and fish habitat will be monitored during the Project to ensure that increased water velocities during dewatering do not cause downstream erosion;
- Any fish rescue will be conducted by a qualified biologist prior to initiating demolition activities and fish will be removed and relocated as per DFO guidance and consultation; and
- Wildlife and wildlife habitats within the Project site will be re-vegetated upon site improvement, which will partially restore habitat conditions in the Project site, over time.

5.11.3.3 Characterization of Potential Interactions Following Mitigation

While the majority of interactions between the Project and traditional land and resource use can be considered temporary and can be mitigated effectively, there are some interactions that cannot be mitigated. These interactions will be confined to the Project site, and will be associated with the bladder replacements and the forebay bridge repair/replacement.

Ground and water disturbance during Project activities, though very limited in extent, may result in a temporary localized loss of vegetation and potential displacement of species (i.e., wildlife or fish) used for traditional purposes due to altered habitats or sensory disturbance. Any areas of the Project site that are subjected to ground disturbance and secondary effects (e.g., loss of hydrophilic vegetation along the shoreline) will be restored to ensure soil and shoreline stability after the completion of the Project, as well as reseeding or re-vegetating these areas as part of restoration. Vegetation is anticipated to regrow naturally and other species are anticipated to return to these areas, over time.

Until the repair/replacement of the forebay bridge is completed, access via vehicle to the south shore of the Nepisiguit River by Indigenous persons will continue to be limited, as is currently the case. In the past, NB Power, has permitted some members of Pabineau First Nation to have limited access, via passenger vehicle or all-terrain vehicle, across this multi-span bridge. However, recently this access has been restricted due to safety concerns with the structural stability of the bridge. It is anticipated that the Project will repair or replace the current bridge so as to improve its structural integrity.

It is anticipated that ongoing consultation and engagement with the Indigenous communities will continue throughout the Project. NB Power has an Indigenous monitor on staff to advise it on traditional land and resource use matters. In addition, MTI members and members of the Pabineau First Nation have been invited to participate in biological and archaeological surveys in conducted 2021, and while MTI did participate in some of the surveys, they could not participate in all of them. NB Power will continue to offer such participation for future surveys as well as to observe Project activities while they are taking place. The ongoing consultation and engagement will also provide opportunities for these indigenous groups to share information, ask questions, and discuss concerns about unanticipated interactions between the Project and traditional land and resource use. This would also provide additional opportunities for Indigenous participation in monitoring activities as well as the development of management and reclamation plans at the Project site or to support additional site restoration activities at the site.

5.11.4 Summary

The Project is not anticipated to result in a permanent loss of access by Indigenous communities to practice traditional land and resource use activities in the larger LAA, but will reduce the ease of access to the south shore of the Nepisiguit River via the multi-span bridge while portions of the Project are taking place. However, access to the south shore may be achieved via alternative routes and logging roads, and NB Power may decide to allow the use of the multi-span bridge to resume following the Project, to be determined in consultation with Pabineau First Nation members.

On land, the Project is anticipated to reduce access to the Project site during Project construction activities, but the Project site is already a fenced-in industrial site with no unauthorized public access by Indigenous or non-Indigenous persons alike; as such, Project activities on the Project site are not likely to limit fishing, ceremony, or gathering activities there, nor in the larger LAA. There are no expected restrictions to traditional land or resource use in the remaining portions of the LAA during Project activities.

In light of the above, and in consideration of the Project planning and mitigation to be employed to reduce or minimize environmental impacts, the potential interactions between the Project and traditional land and resource use are not expected to be substantive.

[This page was intentionally left blank]

6.0 Effects of the Environment on the Project

Effects of the environment on the Project are those effects related to risks of natural hazards and influences of the natural environment that might affect the normal execution of the Project or cause damage to infrastructure related to it. Potential effects of the environment on any project are a function of project or infrastructure design in the context of its receiving environment, and ultimately how the project is affected by the natural environment. These effects may arise from physical conditions, land forms, and site characteristics or other attributes of the environment which may act on the project such that the project components, schedule, and/or costs could be substantively and adversely changed.

Based on the nature of the undertaking, the following environmental attributes have been selected for consideration in this assessment:

- Climate and climate change;
- Severe weather events, including wind, precipitation, floods, hail, electrical storms, and tornadoes;
- Seismic activity;
- Forest fires resulting from causes other than the Project; and
- Acid rock drainage (ARD).

6.1 Existing Conditions

6.1.1 Climate and Climate Change

Climate is defined as the statistical averages of precipitation, temperature, humidity, sunshine, wind velocity, and other phenomena such as fog, frost and hail storms for a particular region and time period, generally taken over a 30 year period (NASA 2017). Climate change is an acknowledged change in climate that has been documented over two or more 30-year periods. According to the Intergovernmental Panel on Climate Change (IPCC), climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014). The United Nations Framework Convention on Climate Change (UNFCCC) makes a distinction between climate change attributed to human activities and climate variability attributable to natural causes, by defining climate change as a change of climate directly or indirectly attributed to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods (IPCC 2014).

The definition of climate change dictates the context in which the effects of those changes are discussed. It may not always be fitting to consider the effects of climate change projections on projects which will only take place over a relatively short period of time (e.g., weeks, months, a few years), and which will be initiated in the near future. In the case of this Project, while construction activities associated with the Project components will be intermittent, of short duration, and spread over a period of approximately eight years, the refurbished Station will continue operation for several decades until approximately 2075; as such, this assessment should consider how climate change will influence all aspects of the Project over its expected extended service life. In particular, how climate change could directly affect the Project both physically and financially, and how those effects could, in turn, affect the environment.

The technical boundaries for the establishment of climate conditions include the spatial coverage of weather stations across New Brunswick, the number of parameters monitored at each station, and the temporal coverage of data collection at each station. Technical boundaries for the prediction of effects of climate change relate to the inherent uncertainty of global climate models in predicting future changes in climate parameters, and specifically their application of global-scale prediction algorithms to a relatively localized scale through “downscaling”. Global climate models can provide relatively useful information for predicting and preparing for global and macro-level changes in climate, but their ability to pinpoint location-specific changes to climate on a localized level is limited.

Climate Normals

Current climate conditions are generally described by the most recent 30-year period for which Environment and Climate Change Canada (ECCC) has developed statistical summaries. These summaries are typically referred to as “climate normals”. The closest weather station to the Project with available historical data is the Nepisiguit Falls weather station, located within approximately 1 km of the Station. The Nepisiguit Falls weather station provides historical data for temperature and precipitation, amongst a limited number of other variables, but does not provide historical data for wind. The nearest available wind data is from the Bathurst A weather station, located approximately 25 km northeast of the Station. The most recent 30-year period for which climate normals data are available from both the Nepisiguit Falls and Bathurst A weather stations is for the period of 1981 to 2010. This period has been chosen as the most applicable period for summarizing current climate conditions for the Project (GOC 2021b).

Monthly maximum hourly wind speeds measured at the Bathurst A weather station during 1981-2010 ranged from 41 to 65 km/h. The dominant wind direction was reported as from the west or southwest, the exceptions being in January and September with winds predominantly blowing from the northeast and in November with winds predominantly from the northwest (GOC 2021b). Maximum wind gusts for the same period ranged from 56 km/h to 87 km/h.

Precipitation at the Nepisiguit Falls weather station, on average, was highest from May through until August during the 1981-2010 period. Based on precipitation data from the Nepisiguit Falls weather station, from 1981 to 2010, the weather station has recorded an average of 1,017.3 mm of precipitation per year, of which 750.4 mm was rain and 266.9 cm was snowfall (as water equivalent). Extreme daily precipitation in the past century has ranged from 50.8 mm (December 1951) to 104.4 mm (August 1963). On average, there have been 6.0 days each year with rainfall greater than 25 mm, and snowfalls greater than 25 cm occur on average 1.5 days each year (GOC 2021a).

The annual daily average temperature at the Nepisiguit Falls weather station during the period of 1981-2010 was 4.2 °C, while the average daily maximum was 9.8 °C and the average daily minimum temperature recorded was -1.4 °C. The extreme maximum temperature was 39.4 °C recorded on August 18, 1935 and the extreme minimum temperature was -41.0 °C recorded January 20, 1994 (GOC 2021a).

6.1.2 Severe Weather Events

Extreme precipitation and storms can occur in New Brunswick throughout the year, but tend to be more common and severe during the winter. Winter storms generally bring high winds and a combination of snow and rain, especially in low lying areas.

Extreme rainfall events occur when 50 mm or more rain falls over a 24-hour period. ECCC issues a rainfall warning when this is forecast to occur. Extreme rainfall event data collected for three of New Brunswick's cities indicate that in the 2000s, Fredericton and Moncton had more extreme rainfall events than any other decade on record, while Saint John had the highest number of events during the 1960s. The trends were different in all three communities.

Significant ice storms have affected New Brunswick twice in the past 10 years. The December 2013 ice storm saw the southern region hardest hit (Atlantic Security Group Inc. 2014); however, in January 2017, a significant ice storm affected eastern and northeastern New Brunswick extending from the Acadian Peninsula to the New Brunswick-Nova Scotia border. According to NB Power, between 50 and 100 mm of ice built up on trees and power equipment in the Acadian Peninsula. Ice buildup led to significant damage to NB Power equipment and transmission/distribution infrastructure, as well as impassable roads, wide-spread power outages, and health emergencies (GNB 2017).

In New Brunswick, river valleys and flood plains can pose a risk because of ice jams, harsh weather, and the floods of annual spring thaw. Flooding in New Brunswick is rather common, especially along the Saint John River (ECCC 2017). The Nepisiguit River is also subject to spring freshet flood events due to snow melt and, to a lesser extent, increased flows due to intense rainfall. The NBDELG flood history database (NBDELG 2021d) contains records of flooding in the Nepisiguit River due to ice dams which typically formed at pinch points during spring freshet. Examples of flooding in the NBDELG flood database on the Nepisiguit River from 1923 to 1997 include:

- April/May 1923: An ice jam formed at Project site resulting in a flood which caused damage to several buildings located near the Nepisiguit River associated with the Bathurst mine;
- April 1934: A flood caused by an ice jam at Rough Waters approximately 22 km downstream of the Project site. Ice damaged a transmission line tower and the disruption in hydroelectric service along with high water levels forced the pulp mill to temporarily halt operations;
- January 1950: During a spell of mild weather, an ice jam formed at Nepisiguit Falls resulting in a flood caused by snowmelt. The flood lasted from January 1 to January 31 and resulted in flooding of the road (NBDELG 2021d); and
- May 1991: Heavy rains, combined with the normal spring freshet, resulted in higher than normal flows in the Nepisiguit River, causing a flood at Pabineau First Nation where the water supply well for the community was threatened by flood waters and a bridge spanning the

Pabineau River (a tributary of the Nepisiguit River) was inaccessible due to flooded approaches.

Electrical storms, or thunderstorms, which are more frequent in New Brunswick than the rest of Atlantic Canada, occur on average 10 to 20 times a year (NAV Canada 2001). Generally, only one of these storms (per year) is extreme enough to produce hail. Thunderstorms can produce extremes of rain, wind, hail, and lightning; however, most of these storms are relatively short-lived (GOC 2021a).

Tornadoes are rare in New Brunswick, but can occur. The closest tornado recorded by the Canadian National Tornado database of verified events between 1980 and 2009 was near Bathurst on July 19, 1982, approximately 25 km northeast of the Station (ECCC 2021).

6.1.3 Seismicity

Seismic activity is dictated by the local geology of an area and the movement of tectonic plates comprising the Earth's crust. Natural Resources Canada monitors seismic activity throughout Canada and identifies areas of known seismic activity in order to document, record, and prepare for seismic events that may occur. The Station is located in the Northern Appalachians Seismic Zone, which includes most of New Brunswick and extends into central and western Nova Scotia, as well as the northeastern United States as far south as Boston, Massachusetts. Historical seismic data recorded throughout this zone has identified clusters of earthquake activity. In general, however, historical seismic activity is considered low (Natural Resources Canada 2021a). Earthquakes in New Brunswick generally cluster in three regions: the Central Highlands region (near Miramichi), the Moncton region, and the Passamaquoddy Bay region in the southwestern corner of the province.

The largest earthquake ever recorded in New Brunswick was a magnitude 5.7 (on the Richter scale) event on January 9, 1982, located in the north-central Miramichi Highlands. Aftershocks following this earthquake reached magnitude 5.1 and 5.4. Between 1855 and 1937, other moderate earthquakes in these three regions ranged from 4.5 to 6.0 (Basham and Adams 1984). There are records of one magnitude 5.0 earthquake in the Passamaquoddy Bay region, as well as three magnitude 4.0 earthquakes.

The maximum credible earthquake magnitude for the northern Appalachians region is estimated to be magnitude 7.0, based on historical earthquake data and regional tectonics (Adams and Halchuk 2003). It is noted that there is potential for large earthquakes of up to an estimated magnitude 7.5 along fault zones in the St. Lawrence River region. However, any such events in this region would be 300 to 450 km from the Project site, and, therefore, the amplitude of ground motions at the Project site would be expected to be low due to attenuation over a large distance.

Earthquakes are not unknown in northern New Brunswick, and the closest earthquake recorded was a magnitude 1.8 event in November 2014. There are records of several earthquakes of magnitude greater than 3.0 within 50 km of the Project site, the closest of these being approximately 23 km to the southwest (Natural Resources Canada 2021b).

In summary, a review of historical earthquake records and regional tectonics indicates that the Station is situated in a region of low to moderate seismicity.

6.1.4 Forest Fires

The Fire Weather Index is a component of the Canadian Forest Fire Weather Index System. The index provides a numeric rating of fire intensity, and is the general index of fire danger throughout the forested areas of Canada (Natural Resources Canada 2021c).

The mean Fire Weather Index in the Nepisiguit Falls area for July (i.e., normally the driest month of the year), when risk of forest fire is typically greatest, is rated from 5 to 10, as shown in **Figure 6.1.1**, which is the second lowest rating on the scale of possible fire risk. This risk is based on Fire Weather Normals data, representing the average value of a fire weather code or index over the 30-year period from 1981 to 2010 (Natural Resources Canada 2021c).

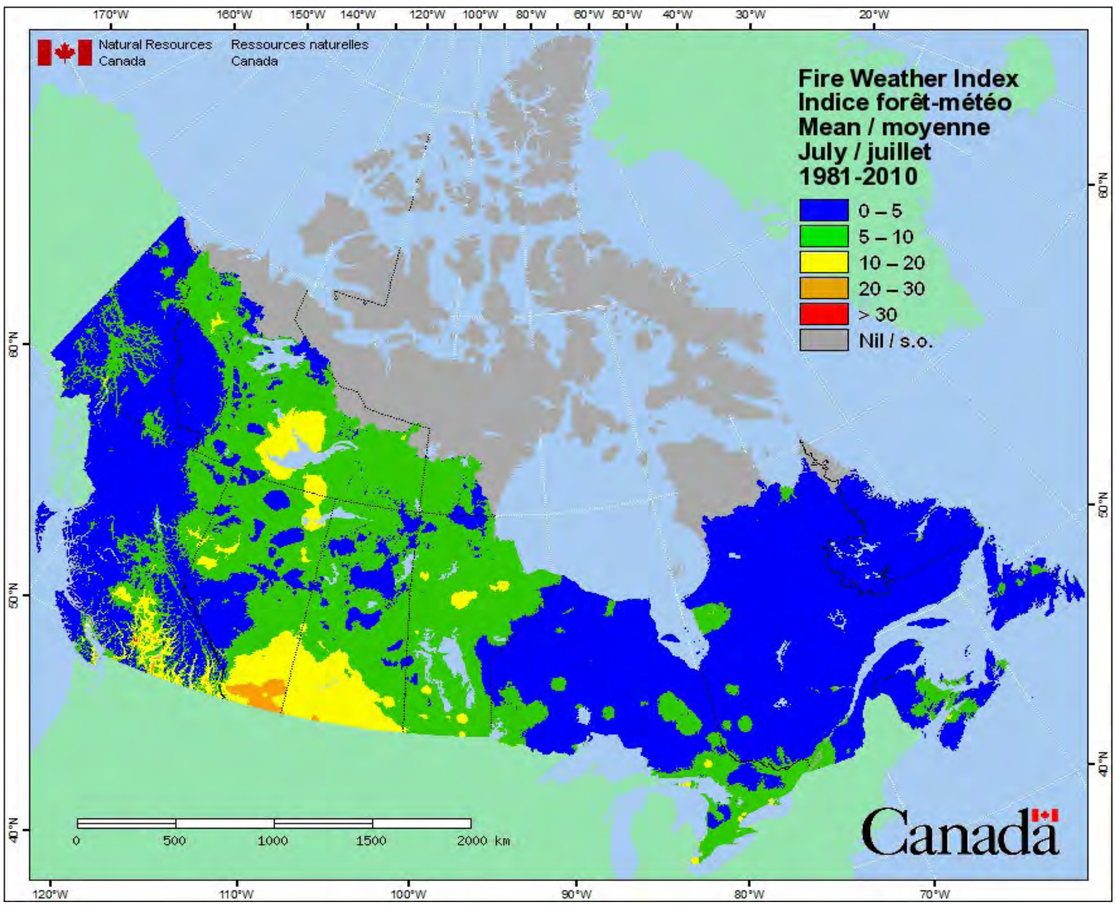


Figure 6.1.1: Natural Resources Canada Fire Weather Index

6.1.5 Acid Rock Drainage

Some bedrock contains minerals that can generate acid rock. Acid rock drainage and associated metal leaching (ML) occur when sulphide minerals react with oxygen, ferric ion, and water to produce sulphuric acid (i.e., the exposure of sulphide-rich rocks in oxidizing environments). The resulting acidic runoff can mobilize metals, including heavy metals, such as iron, arsenic, manganese, and copper from the surrounding bedrock, releasing them into aquatic environments. Similarly, ARD can develop from exposed surficial material and soils containing weathered sulphide-bearing bedrock.

While exposing and physically disturbing sulphide-bearing rock is most often a concern encountered during activities such as mining, any exposure or physical disturbance causing ARD can negatively impact the environment, human health, and infrastructure. Characterized by pH levels as low as 3.0, ARD can be harmful for aquatic habitats (e.g., causing fish kills), and has the potential to contaminate drinking water supplies with increased concentrations of toxic and carcinogenic heavy metals. Over time, the acidity also has the potential to corrode and degrade metal water mains, metal culverts, and pipes, further leaching lead, copper, and zinc into water bodies.

The bedrock geology in the localized area of the Station is known to be a rhyolite crystal tuff of the Tetagouche Group, an igneous rock formed at the surface from magma rich in silica. The Tetagouche Group, along with much of the bedrock in the region, is a volcanic massive sulphide deposit and has a high potential to generate ARD (NBDNR 2008). However, since excavation to bedrock is not anticipated as part of the Project, ARD is not expected to be of substantive concern.

6.2 Assessment of Potential Interactions between the Environment and the Project

As a factor of safety and a matter of responsible engineering practice, the design and materials to be chosen for the Project will be selected so that the Project will withstand environmental stressors that could occur from various natural and environmental phenomena (e.g., extreme storms, flood events, and ARD). The EIA has been carried out in parallel to preliminary design, and the results of the EIA have informed and are continuing to inform the design of the Project such that potential concerns are addressed and the potential for significant adverse effects of the environment on the Project are minimized.

6.2.1 Potential Interactions

6.2.1.1 Effects of Climate and Extreme Weather on the Project

To assess the environmental effects of climate on the Project, current climate must be considered. Current climate conditions have been established by compiling relevant historical data and establishing a climatological background for the Bathurst Mines/Nepisiguit Falls area.

Recent climate trends (1981-2010 averages and extremes) have been assessed to determine the likelihood, and effect, of severe and extreme weather events on the Project so that they may be accounted for in both the engineering design, as well as timelines of various Project components. The most relevant climate changes that could potentially have effects on the Project include:

- Increased frequency and magnitude of heavy precipitation events; and
- Increased frequency of extreme storms accompanied by heavy and/or freezing precipitation, thunderstorms, and strong winds; and increased incidence of flooding and erosion.

Each of these effects must be considered in terms of how they may adversely affect the Project if they are not accounted for in the planning, engineering and design. The environmental attributes described have the potential to affect the Project in several ways, including but not limited to:

- Delays in carrying out Project activities as a result of severe weather;
- A reduction in visibility and an inability to manoeuvre heavy equipment;
- Changes to the ability of workers to access the work site; and
- Damage to heavy equipment and site infrastructure.

Extreme snowfall can also affect winter Project activities by causing delays in the movement of materials in and out of the Project site, and resulting in additional effort for snow clearing and removal. This additional effort, however, would not substantially change the Project schedule.

Extreme snowfall contributing to unusual flooding during snowmelt and extreme rainfall events could also potentially lead to flooding and erosion. It is noted in **Section 6.1.2** that the Nepisiguit River may be prone to extreme flooding as shown by past events, and the Station has a demonstrated ability to manage elevated flows including during the spring freshet and extreme precipitation events through spilling excess water or maximizing electricity generation. Heavy rain, snowfall and/or freezing rain events could also cause an interruption to services, such as communications or electricity.

During lightning storms, fault currents (defined as a current that is several times larger in magnitude than the current that normally flows) may result from a lightning strike and could result in danger to personnel and damage to infrastructure (e.g., powerhouse, control rooms, and instrumentation). Lightning strikes could also result in power outages from damage to power lines.

Some effects, such as damage to infrastructure, can also result in consequential effects on the environment. These types of environmental effects are addressed as accidents, malfunctions, and unplanned events in **Section 7.0**.

6.2.1.2 Effects of Seismic Activity on the Project

The Project site is geographically situated within an identified seismic zone where historical earthquake activity has been identified (Northern Appalachian Seismic Zone). There are historical records of one magnitude 5.7 earthquake in the Miramichi Highlands region, as well as four earthquakes of magnitude 3.1 to 3.4 within 50 km of the Station (Natural Resources Canada 2021b). As previously discussed, the maximum credible earthquake magnitude for the Northern Appalachians Seismic Zone is estimated to be magnitude 7.0, based on historical earthquake data and regional tectonics (Adams and Halchuk 2003). It is noted that there is potential for large earthquakes of up to an estimated magnitude 7.5 along fault zones in the St. Lawrence River region. Any such events in this region, however, would be between 300 and 450 km from the Project site, and therefore, the amplitude of ground motions at the Project site would be low due to attenuation over a large distance.

Although the level of historical seismic activity near the Station is considered to be low to moderate, past occurrence of seismic activity in an area is not necessarily an indicator that a significant seismic event could or could not occur in the near future.

Based on the low frequency of recorded earthquakes in the region, and, therefore, low probability that a major seismic event would occur in the immediate vicinity of the Project during the Project's lifespan, major Project damage or interruption to activities due to earthquakes during any phase of the Project is considered to be low.

6.2.1.3 Effects of Forest Fires on the Project

The Project site is situated within a sparsely developed region in northern New Brunswick where forest fires are not uncommon.

Aerial imagery indicates that the forests surrounding the Station have been subject to varying degrees of harvest and silviculture. Fire behaviour normal mapping (Natural Resources Canada 2021c) indicates that the mean rate of spread of fire in the Project area is between one and three metres per minute. The rate of spread is based on several factors including fuel type, forest health, and crown base height. The mean rate of spread for the Project area is the second lowest on the scale used by Natural Resources Canada.

In the unlikely event that a forest fire encroaches on the Project site, New Brunswick has a forest fire control program in place to identify and control fires, minimizing the potential magnitude and extent of any forest fire, and their potential consequential effects on the Project. Local and provincial emergency response crews will provide for rapid detection and response to any identified fire threat. This includes fires that could start within the Project site perimeter as well as fires approaching from outside the area (i.e., forest fires).

With respect to the effects of forest fires on the Project, the facility structures could be damaged by extreme heat as well as Project-related equipment and vehicles. Smoke generated by forest fires could adversely affect project personnel as well as NB Power employees resulting from reduced air quality.

6.2.1.4 Effect of Acid Rock Drainage on the Project

To assess the potential effects of ARD on the Project site, it is necessary to examine the nature of Project activities and how they interact with potential sulphide bearing bedrock. Since the Project primarily involves upgrades and repairs to existing structures, and no major excavation or blasting of bedrock materials is planned, it is not expected that bedrock will be exposed outside of the Nepisiguit River channel, despite the high potential for bedrock in the Project area being sulphide-rich.

Based on the identified areas proposed for life extension project and the nature of the Project, ARD is not likely to have any adverse effects on water quality or construction equipment during or after the completion of the Project activities.

6.2.2 Mitigation

Mitigation strategies for minimizing the likelihood of a significant effect of the environment on the Project are inherent in: the planning process being conducted, the application of engineering design codes and standards, construction practices, and monitoring. To address these environmental effects, proactive design, planning, and maintenance are required in consideration of the potential normal and extreme conditions that might be encountered throughout the life of the Project.

6.2.2.1 Mitigating Effects of Climate Change and Extreme Weather on the Project

The following mitigation measures will be implemented to prevent effects of climate change and extreme weather on the Project.

- Disruption of Project activities and delays to the Project schedule will be avoided by scheduling tasks that require precise and/or timely movements (e.g., bladder replacements, tailrace structural repairs, and forebay structural repairs) for periods when the weather conditions are favourable. A disruption allowance will be considered in Project and operational scheduling.
- Extreme precipitation events are an expected work condition and the Project schedule allows for weather conditions typical for the northeastern New Brunswick region. Site water management features and erosion and sediment control structures will be in place early in the Project to manage potential increased site run-off from precipitation events that could occur.
- Erosion as a result of extreme precipitation and potential flooding is not anticipated to have a substantive adverse effect on the Project due to standard mitigation measures that will be implemented (e.g., management of site water, use of erosion and sedimentation control structures, and construction methods that stabilize erodible soils as early as possible after the ground has been disturbed). Following construction, exposed soils will be stabilized, roadways and laydown areas will use suitable gravel bases and/or sub-bases to prevent erosion, and exposed areas will be vegetated where possible to prevent surface erosion.
- Temporary structures required for life extension activities (e.g., cofferdams) will be designed such that they will be able to withstand extremes of temperature, wind, rain, snow, and ice events for the duration those temporary structures are in place.

As described above, environmental stressors potentially associated with severe weather would be more than adequately addressed by engineering design, and careful equipment and materials selection for decommissioning Project-related infrastructure.

6.2.2.2 Mitigating Effects of Seismic Activity on the Project

Temporary infrastructure (e.g., construction offices and cofferdams) required to support Project activities will be designed to the applicable standard in consideration of the maximum credible earthquake magnitude for the region. Since the primary Project purpose is to extend the life of a Station that has not been adversely affected by seismic activity in the region, it is reasonable to expect that the Station will not be adversely affected by future seismic activity once the upgrades and repairs are completed. Also, based on the nature of site improvement activities, it is not anticipated that they would be impacted by seismic activity. Therefore, seismicity is not considered to have the potential to substantively damage Project infrastructure or components during all phases of the Project, due to planned design mitigation, and generally low seismicity of the area.

6.2.2.3 Mitigating Effects of Forest Fires on the Project

The Project and associated infrastructure, including the dam facility structures consist primarily of concrete, brick, and metal — with the exception of the bridge deck, and bladders that sit atop the dam structure. Project components within the Nepisiguit River are less likely to be impacted by a fire than components on land.

There is minimal vegetation adjacent to the facility structures which provides a buffer between a potential fire and the Project components.

Petroleum products and flammable substances that may be required by contractors refurbishing the Station will be stored within secondary containment to reduce likelihood of spills and potential ignition.

Through integrated and coordinated emergency response capabilities at the local and provincial levels, personnel will mobilize away from the Project site if forest fires are affecting the local area, and will only return under clear and safe conditions, as determined by emergency response agencies in the province.

6.2.2.4 Mitigating Effects of Acid Rock Drainage on the Project

Since the primary Project purpose is to refurbish or replace components of the Station, there are no proposed activities planned that will involve exposing large areas of potential sulphide-bearing bedrock in either the short-term or long-term.

If unanticipated areas of sulphide-bearing bedrock are located during the Project activities, activities that expose or break it up, such as blasting and excavating will be avoided and/or minimized. If disturbance is unavoidable, rocks and surficial materials with sulphide content equal or greater than 0.3 weight percent must be managed in accordance with provincial regulations. The primary approach to prevent and mitigate ARD and ML is to minimize the supply of the primary reactants for sulphide oxidation (e.g., air or oxygenated water) and/or maximize the availability of acid neutralizing minerals (e.g., crushed limestone).

6.2.3 Characterization of Potential Interactions Following Mitigation

The potential effects of the environment on all Project phases will be considered in the planning and design of the Project and in the scheduling of Project activities to limit delays, prevent damage to infrastructure and the environment, and to maximize the safety of staff. Compliance with detailed design engineering completed for the Project will account for weather extremes, seismicity, forest fire threats, and ARD through built-in factors of safety to prevent undue damage to infrastructure and equipment or schedule delays from such events or occurrences. Although it is possible, even likely, for the Station to experience extreme environmental conditions during the Project lifecycle, a substantive delay (e.g., a delay for more than one season) is not anticipated. Further, no substantial damages to Project infrastructure are anticipated as a result of natural environmental conditions due to the design and type of activities proposed.

Therefore, the effects of the environment are not expected to adversely affect the Project in a manner that cannot be planned for or accommodated through design and other mitigation and adaptive management strategies. As a result, the effects of the environment on the Project are not expected to be substantive.

6.3 Summary

Environmental management is an inherent consideration in the best management practices of the design and associated Project risk management. Equipment and materials that are able to withstand severe weather and other influences will be used. Environmental stressors, such as those that could arise as a result of severe weather, seismic events, ARD or other factors (e.g., fires), would more than adequately be addressed by good engineering design, materials selection, best practices, and scheduling foresight. The Project schedule will provide allowances so as to not adversely be affected by a potential delay caused by effects of the environment. While there is potential for natural forces to affect the Project, it is not likely to have a substantive effect due to planned mitigation and design.

Throughout the duration of the Project, NB Power will monitor changing information and implement adaptive management so that the effects of the environment on the Project will be mitigated if new situations develop.

[This page was intentionally left blank]

7.0 Accidents, Malfunctions, and Unplanned Events

This section identifies the potential accidents, malfunctions, and unplanned events that could occur as part of the Project. The assessment focuses on events that are considered credible, based on the Project description and the experience of the EIA team in assessing similar projects.

7.1 Approach

The general approach to assessing the potential environmental interactions of the selected potential accident, malfunction, or unplanned event scenarios involves the following:

- Describing the potential accident, malfunction, or unplanned event;
- Considering if the potential accident, malfunction, or unplanned event could occur during the life of the Project, and during which activity(ies);
- Determining with which valued component(s) (VCs) the potential accident, malfunction, or unplanned event may interact;
- Describing the Project planning, safeguards, and mitigation established or proposed to minimize the potential for such occurrences to happen;
- Considering the contingency or emergency response procedures applicable to the event; and
- In consideration of the above, assessing the potential interactions of accidents, malfunctions, and unplanned events on related VCs following mitigation.

Spatial and temporal boundaries for considering residual environmental effects of potential accidents, malfunctions, and unplanned events that may arise as a result of the Project are the same as those for each VC to which they apply, presented in **Section 4.1** of this document.

7.2 Description of Potential Credible Accidents, Malfunctions, and Unplanned Events

Based on the nature of the Project, general knowledge of the environment within which the Project is located, as well as the experience of the Proponent and the EIA team, the following credible accidents, malfunctions, and unplanned events have been selected for this assessment and are described in greater detail in the following sections:

Failure of an Erosion and Sediment Control Measure: Erosion and sedimentation control (ESC) measures prevent exposed soil from mobilizing and entering undisturbed areas as a result of rainfall or spring runoff. A failure of an ESC measure could result in mass wasting of soil or siltation of the receiving watercourse (i.e., the Nepisiguit River).

Failure of a Cofferdam: Failure of a cofferdam is considered separately from erosion and sediment control measures. Failure of a cofferdam could result in a sudden release of water into the work area and could cause siltation of the watercourse, fish injury or mortality, or pose a risk of injury to workers on site.

Vehicle Accident: A vehicle accident is possible at the Project site or while Project-related vehicles are in transit on provincial roads. A vehicle accident includes a collision with other vehicles, pedestrians, wildlife, or structures/objects, and potentially cause damage to property or pose a risk to the health and safety of workers, the public, or wildlife. A fire or fuel spill could also occur as a consequence of a vehicle collision, compounding the initial effects by potentially threatening the atmospheric environment, the acoustic environment, surface water, groundwater, fish and fish habitat, and wildlife and wildlife habitat.

Accidental Release of a Hazardous Material: An accidental release of fuel used in vehicles or mobile equipment on-site may occur during refuelling of machinery or trucks as a result of human error or equipment malfunction, potentially affecting surface water, groundwater, fish and fish habitat, wildlife and wildlife habitat, vegetation, and wetlands.

Discovery of a Heritage Resource: Given that the Station is located immediately adjacent to and within the Nepisiguit River and the historic Nepisiguit Mi'gmaq Trail, and given the rich Indigenous presence in the area, there is a high potential that Pre-Contact archaeological resources could be present on or underneath the ground surface. Previously undiscovered archaeological resources (i.e., artifacts) could also be uncovered during dewatering of the impoundment. As minimal excavation is planned for this Project, it is unlikely that heritage resources beyond the river extents would be found through the course of the Project. Based on the bedrock geology (i.e., rhyolite, an intrusive igneous rock) underlying the Project site, it is unlikely that palaeontological resources (i.e., fossils) could be found on the Project site or in the dewatered impoundment during the Project. Fossils are formed in sedimentary rock when remains of dead plants or animals are buried under material deposited over time.

Disturbance of Roosting Bats or Nesting Birds: During the life extension activities associated with the powerhouse (i.e., garage door installation and turbine-generator replacement), there is the potential that bats could be roosting in or on the powerhouse structure, or certain species of birds could use the structure as nesting habitat. The three species of bats found in New Brunswick — little brown myotis, long-eared myotis, and tri-colored bat or Eastern pipistrelle — are all ranked as Endangered under both the federal *Species at Risk Act* (SARA) and the New Brunswick *Species at Risk Act* (NB SARA) (AC CDC 2021). Three bird species, Chimney Swift, Barn Swallow, and Cliff Swallow, typically use structures as nesting habitats and are known to inhabit the general vicinity of the Project location (AC CDC 2021). Both Chimney Swift and Barn Swallow are ranked as Threatened by SARA and NB SARA.

Nest sweeps were conducted during the week of July 5, 2021 to observe the presence/absence of nests within or on the Station's buildings and structures. The sweeps, including surveying the powerhouse from various angles using a remotely piloted aircraft system (RPAS), indicated no evidence of bats, birds, or bird nests in or on the powerhouse structure, nor observed crevices that would allow bats or birds entry into the structure. Following the outcome of the nest sweeps, it is considered unlikely that these species of concern are utilizing the structure for roosting or nesting. As a result, this potential interaction will not be carried forward for further consideration. Nest sweeps will be conducted prior to subsequent phases of the Project as it carries on over the course of the next eight years or so to ensure that nesting birds or roosting bats are not disturbed during the Project.

7.3 Potential Interactions between Accidents, Malfunctions, and Unplanned Events and Related Valued Components

Based on the nature of the above credible events and the EIA team's knowledge of their potential to interact with the environment, the VCs with a reasonable potential to interact with these potential accidents, malfunctions, or unplanned events are identified in **Table 7.3.1**.

Table 7.3.1: Potential Interactions of Accidents, Malfunctions, and Unplanned Events with Valued Components

Accident, Malfunction, or Unplanned Event	Atmospheric Environment	Acoustic Environment	Groundwater	Surface Water	Fish and Fish Habitat	Vegetation and Wetlands	Wildlife and Wildlife Habitat	Socioeconomic Environment	Heritage Resources	Traditional Land and Resource Use
Failure of an Erosion and Sediment Control Measure				✓	✓	✓	✓			✓
Failure of a Cofferdam				✓	✓			✓		
Vehicle Accident	✓	✓	✓	✓	✓		✓	✓		
Accidental Release of a Hazardous Material	✓		✓	✓	✓	✓	✓			✓
Discovery of a Heritage Resource									✓	
Disturbance of Roosting Bats or Nesting Birds										

Legend: ✓ indicates a potential interaction that is assessed further below

Those accidents, malfunctions, or unplanned events that may result in an interaction with a specific VC are identified with a checkmark in the table above, and are therefore carried for further assessment below.

Accidents, malfunctions, or unplanned events that are not identified with a checkmark in the table above are not expected to result in an interaction with a specific VC or VCs, and are thus not discussed further.

7.3.1 Failure of an Erosion and Sediment Control Measure

ESC measures prevent erosion of surface soils and the resulting surface runoff from directly entering surface water bodies. Failure of an ESC measure could be a result of the measure being insufficient to manage a given runoff event (e.g., rainfall or spring runoff exceeding capacity) or if the implementation was poorly constructed.

A failure of an ESC measure could primarily affect fish and fish habitat. The discharge of runoff containing sediment to watercourses during storm events or spring runoff could result in the degradation of adjacent surface water bodies, wetlands, and fish and fish habitat which those environments support. The effects on fish and fish habitat could include a temporary reduction in water quality due to increased sediment load. If the release were to occur during spawning periods, spawning beds could be negatively affected as sediment may cover the gravel beds and suffocate the eggs. Aquatic organisms may be adversely affected by a sediment release, potentially reducing the fish's food supply. Consequential environmental effects could result to surface water, vegetation and wetlands, and wildlife and wildlife habitat.

In addition, a failure of an ESC measure could affect traditional land and resource use as a consequential environmental effect. Indigenous communities that practice traditional activities near the Project site could be affected if the fish and fish habitat affected by an ESC failure were being used for traditional purposes.

7.3.1.1 Mitigation

Key mitigation to prevent a failure of an erosion or sedimentation control measure includes:

- Construction of the ESC measures using quality materials and sound and proven construction practices in accordance with industry best practice;
- Periodic inspection and maintenance (as required) of the ESC measures, particularly following each precipitation event;
- Contingency plans will be developed for extreme rainfall or spring runoff events including:
    - Monitoring of surface runoff conditions during heavy rainfall/spring runoff and operational observations to evaluate the need for improvements in surface runoff control,
    - Cover will be applied to highly erodible areas,
    - Clean-out of check dams will be conducted, and
    - Provision of a stockpile of sediment and erosion control materials.
- A Project-specific Environmental Management Plan (PSEMP) with defined contingency and emergency response procedures in the event of a failure of an ESC measure will be developed and implemented; and
- With the exception of limited grading of the laydown area and possibly the north bridge abutment, no excavation is planned for the Project.

Note that approaches will vary depending upon season, and NB Power site personnel shall indicate approaches for summer low flow periods, spring-fall high flow periods, and frozen ground high flow periods.

7.3.1.2 Potential Interactions Following Mitigation

The installation, maintenance, and monitoring of ESC structures is a routine activity on construction sites and industrial operations, and is well understood by site managers and construction personnel. With daily visual monitoring of erosion and sedimentation control devices, conducting maintenance of them as necessary, periodically removing accumulated sediment, and active water management on-site, the risk of a failure of ESC measures occurring is expected to be very low. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential interactions of a failure of an ESC measure on surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resource use are not expected to be substantive.

7.3.2 Failure of a Cofferdam

A failure of a cofferdam could interact with the socioeconomic environment, surface water, and fish and fish habitat.

Construction of cofferdams will allow work to be carried out in dry conditions in isolation from the watercourse.

Failure of part or all of a cofferdam prior to dewatering of the impoundment could result in the injury of workers employed in construction work. Workers and equipment could be on the cofferdam or immediately downstream of the cofferdam. A rapid failure of a cofferdam may prevent workers from evacuating the site before being injured. This could be considered an interaction with the socioeconomic environment VC (from a human health and safety perspective).

Surface water and fish and fish habitat could be negatively affected by the sediment and waste material by water breaching the cofferdam.

7.3.2.1 Mitigation

Key mitigation to prevent a failure of a cofferdam includes:

- The cofferdams will be designed and constructed to the applicable standards and for the hydraulic conditions specific to the site;
- Use of ESC measures surrounding the cofferdams to prevent erosion and sedimentation;
- Regular visual inspection of the cofferdams and their constituent elements will be carried out during and after their construction; and
- A PSEMP with defined contingency and emergency response procedures will be implemented.

7.3.2.2 Potential Interactions Following Mitigation

The cofferdams will be designed to industry standards taking into account the hydraulic conditions of the Nepisiguit River at the Project location. The use of large rockfill material for construction of the cofferdams will provide structural integrity of the cofferdams while minimizing the potential for release of finer materials if more granular fill were to be used. With thorough design and regular inspection/maintenance combined with mitigation measures, contingency and emergency response procedures, and best practices, the potential interactions of a failure of a cofferdam with surface water, fish and fish habitat, and socioeconomic environment are not expected to be substantive.

7.3.3 Vehicle Accident

A vehicle accident could affect the socioeconomic environment, the atmospheric environment, the acoustic environment, groundwater, surface water, fish and fish habitat, and/or wildlife and wildlife habitat.

Vehicles will be active across the Project site for the entirety of the Project duration as well on provincial roads as waste material resulting from the refurbishment is transferred to the various approved disposal facilities (location dependent upon material type). Vehicle collisions have the potential to pose a risk to human health and safety and other property such as Project infrastructure or private property. This could have an adverse effect on the socioeconomic environment.

Consequential environmental effects of a vehicle accident could occur on the atmospheric environment, as fires or fuel spills arising from a vehicle accident could result in a temporary and localized reduction in air quality. The resulting noise from a vehicle accident as well as from emergency response vehicles could cause an interaction with the acoustic environment. Fuel spills resulting from a vehicle accident could adversely affect surface water, groundwater, or fish and fish habitat, as surface or groundwater resources may become contaminated by fuel, potentially threatening potable water supplies and fish and fish habitat. Finally, a vehicle accident could have a direct effect on wildlife in the event of vehicle-to-wildlife collision, and an indirect effect in the event of a fuel spill or fire resulting from a vehicle collision.

7.3.3.1 Mitigation

Key mitigation to prevent a vehicle accident includes:

- Use of the new bypass road by Sentier NB Trail users;
- Establishment of a traffic control plan;
- Select a preferred transportation route to optimize safety by using roads that are designed to accommodate the vehicle weights that will be associated with the Project;
- Vehicles travelling to and from the Project site will adhere to posted speed limits, weight restrictions, and other traffic safety rules, and drivers will adjust their speed to conditions accordingly;

- Drivers will also heed wildlife warning signs and reduce speed in areas identified as posing a potential risk of wildlife collision;
- Pedestrian zones will be identified to allow workers access throughout the work area on foot;
- A communications plan will be established to engage with local communities potentially affected by Project-related traffic; and
- A PSEMP with defined contingency and emergency response procedures in the event of a vehicle accident will be developed and implemented.

7.3.3.2 Potential Interactions Following Mitigation

Though vehicle accidents may occur with any project, particular attention will be paid to conducting Project operations in a careful and safe manner so as to reduce the risk of a serious vehicle accident. Provincial highways are designed to withstand Project-related traffic, and Nepisiguit Falls Road which formerly served the Brunswick Mine #6 now sees little traffic other than mainly from local residents but was formerly able to withstand larger traffic volumes while the mine was operational. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential interactions of a vehicle accident on the socioeconomic environment, atmospheric environment, acoustic environment, surface water, groundwater, fish and fish habitat, and wildlife and wildlife habitat are not expected to be substantive.

7.3.4 Accidental Release of a Hazardous Material

The accidental release of a hazardous material through spills could affect primarily groundwater, surface water, and fish and fish habitat, with consequential environmental effects possible to the atmospheric environment, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resource use.

In addition to liquid hazardous materials that are present at any industrial facility, it is likely that, given the age of the facility, some other solid or gaseous hazardous materials will be found on-site in the buildings or equipment, and direct exposure to these materials could cause a concern to human health and safety as well as the environment. Possible examples include lead-based paint, asbestos, ozone depleting substances, creosote-treated wood, and materials containing polychlorinated biphenyls (PCBs), mould, and the like.

Aside from the hazardous materials associated with the historic operation of the Station, no hazardous material or liquid fuels will be permanently stored on the Project site during the Project. As vehicles and mobile equipment used on-site will need to be refuelled on a daily basis for their continued operation, fuels will be brought on-site daily by mobile tankers operated by approved refuelling contractors. Refuelling activities will be carried out in a designated area (at least 30 m away from watercourses or wetlands) using defined procedures to prevent the occurrence of a spill. Waste materials and equipment formerly containing hazardous liquids will be first drained of their liquids, and then the solid waste will be stored in sealed bins pending their transport to disposal facilities.

An accidental spill of hydrocarbons or other substances may contaminate air, soils, and groundwater and, through runoff, contaminate watercourses. Contaminants may adversely affect both terrestrial and aquatic habitats and their species, including migratory birds. Loss of petroleum hydrocarbons, hazardous materials, or other substances may volatilize and adversely affect ambient air quality on a temporary and localized basis.

Chemical and fuel spills may enter a watercourse directly, potentially affecting water quality and fish and their habitat, with the extent of effects depending upon the nature of the material and the quantity released. The effects could range from a small localized spill, which is contained and remediated quickly, to a large release of a highly soluble material that affects the receiving watercourse. Possible negative effects to fish and fish habitat could include direct mortality of fish and aquatic organisms, degradation of surface water quality, and potential injury or death of wildlife in the event of exposure. If natural resources affected by a spill are used for traditional purposes by Indigenous persons, a consequential environmental effect of a spill could also occur to traditional land and resource use.

Effects on vegetation and wetlands from an accidental hazardous materials release include a physical harm or death of vegetation species, a reduction or loss of wetland function as a habitat for fish and wildlife, and accretion of contaminants in wetland sediments. Contaminants are less likely to move through a wetland system at the same rate as riparian systems due to the generally lower mobility of water and sediments. Contaminants may build up in the sediments and be released into the ecosystem over time, rather than being flushed out over a season as with a riparian system.

7.3.4.1 Mitigation

Key mitigation to prevent an accidental release of a hazardous material includes:

- A PSEMP with defined contingency and emergency response procedures in the event of a hazardous material spill will be developed and implemented;
- A Spill Contingency Plan will be developed as part of the PSEMP for substances anticipated to be brought on-site during the Project activities;
- Fuelling operations will be conducted in designated areas located at a minimum distance of 30 m from wetlands and surface water bodies;
- Vehicle maintenance, including the changing of oil and lubricants, will not be permitted on-site;
- Waste materials and equipment formerly containing hazardous liquids will be first drained of their liquids, and then the solid waste will be stored in sealed bins pending their transport to disposal facilities;
- Releases potentially caused by vehicle accidents will be addressed initially by local emergency response agencies and as directed by the NBDELG. Subsequently, site contractors will contain the spill and remove contaminated soils and sediment for disposal; and
- Emergency spill kits will be available on-site.

Small spills can typically be cleaned up effectively with minimal long-term impacts, and larger spills are not likely to occur based on limited quantities of hydrocarbons anticipated to be present on-site during the Project.

7.3.4.2 Potential Interactions Following Mitigation

With no planned storage of liquid hazardous materials on-site beyond those presently used at the Station, and careful implementation of best practices during refuelling of equipment, the risk of spills resulting from the Project is expected to be low. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential interactions of an accidental release of a hazardous material on the atmospheric environment, water resources, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resource use are not expected to be substantive.

7.3.5 Discovery of a Heritage Resource

The discovery of a heritage resource would interact with the heritage resources VC.

Any ground breaking or earth moving activity has the potential to uncover previously undiscovered heritage resources. Archaeological resources (i.e., artifacts) tend to be found in surficial soils and when discovered, whereas palaeontological resources (i.e., fossils) tend to be found in bedrock. Little excavation is planned for the Project aside from potential grading the laydown area—which is located in a previously disturbed area—as well as the possible excavation of the north bridge abutment, however heritage resources could also be found in the impoundment substrate during dewatering activities. The discovery of these resources can provide valuable information about human activity or use in the distant past (in the case of artifacts), or the presence of wildlife and vegetation in earlier eras (in the case of fossils).

With respect to the Project, it is possible that previously undiscovered heritage resources in the form of artifacts could be found along the impoundment or in the impoundment substrate during dewatering for the bladder repairs or structural repairs. The Station is located immediately adjacent to and within the Nepisiguit River and the historic Nepisiguit Mi'gmaq Trail, and the proximity to navigable rivers, streams and lakes tends to be associated with the presence of archaeological resources, since these waterways were once used heavily as "highways" for travel and conveyance as well as for the harvesting of natural resources (e.g., fishing and hunting). An archaeological impact assessment (AIA) consisting of a walkover was conducted in summer 2021 by a professional archaeologist, and indicated the potential for the Project site to harbour archaeological resources both on land underwater within the impoundment (which might be exposed during dewatering if they are present). Further archaeological monitoring during Project activities will address this uncertainty.

With respect to palaeontological resources, it is highly unlikely that fossils could be found in the underlying bedrock, which is an intrusive Middle Ordovician rhyolite formation (GNB 2008). The rock underlying the Project was formed when magma from the Earth's interior intruded into the surrounding rock from deep below the surface, cooled, and then crystalized. In order for fossils to occur in rock, the remains of organisms (i.e., plants, animals) must be incorporated into sediments that eventually form rock over millions or billions of years. Intrusive rocks do not contain fossils because they intrude from molten rock and only reach the surface through weathering.

7.3.5.1 Mitigation and Response

Key mitigation measures to minimize the potential for the discovery of a heritage resource include conducting an AIA, consisting of background research, map and model interpretation, a walkover of the Project site, and associated shovel test pitting or archaeological monitoring of any areas potentially disturbed that were determined through the walkover to have a moderate to high archaeological potential. If archaeological or heritage resources are discovered through the AIA, further mitigation including archaeological monitoring during Project activities, obtaining a site alteration permit, or other measures would be considered. An AIA (walkover) of the areas within 80 m on both sides of the impoundment was conducted by a professional archaeologist in summer 2021 and indicated the potential for archaeological resources to be are present, despite the limited amount of ground disturbance associated with the Project.

Additionally, a PSEMP with defined contingency and emergency response procedures in the event of the accidental discovery of a heritage resource will be developed and implemented. The PSEMP will include contingency and emergency response procedures to be implemented in the event of a chance find of a heritage resource.

In the event that an archaeological or cultural resource or artifact is discovered during the Project, the following procedure will be followed, to be updated as part of the development of the PSEMP:

- Work will be immediately stopped, and the area will be marked to prevent further disturbance. An exclusion zone of 100 m surrounding the find will be established;
- The Site Manager will immediately contact the Archaeology and Heritage Branch (AHB) of the New Brunswick Department of Tourism, Heritage and Culture (NBDTHC) to notify them of the discovery and establish a mitigation plan;
- Notify affected First Nations of the discovery in a manner consistent with the directions of AHB;
- No additional work will be permitted at the site until approval has been received from the appropriate regulatory agency to resume the work;
- If bones or human remains are found, work in the area must cease, and the RCMP shall be immediately notified;
- No one shall disturb, move or conceal any uncovered human remains; and
- If the discovered resources are related to Indigenous culture, the New Brunswick Department of Aboriginal Affairs will be contacted to determine how best to proceed with respect to repatriation of the resources.

7.3.5.2 Potential Interactions Following Mitigation

With the conduct of an AIA (i.e., archaeological monitoring or shovel testing) to confirm that archaeological resources are not present, and with the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential for an accidental discovery of a heritage resource is not expected to be substantive.

7.4 Overall Summary

In light of the above, and with the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential interactions of all credible accidents, malfunctions, or unplanned events on all VCs are not expected to be substantive.

[This page was intentionally left blank]

8.0 Indigenous Consultation

The entire province of New Brunswick is unceded Indigenous territory and is subject to the Peace and Friendship Treaties originally signed in 1725 by the British with the Wolastoqey (Maliseet), Mi'kmaq, and Peskotomuhkati (Passamaquoddy) Nations (along with other First Nations located in what is now known as Maine, New Hampshire, and Nova Scotia), and renewed in specific agreements thereafter (including notably in 1754). Section 35 of the *Constitution Act, 1982* recognizes and reaffirms the rights and title of the Aboriginal peoples of Canada, and the Supreme Court of Canada has confirmed that First Nations continue to have treaty rights to carry out traditional activities (including the right to hunt, trap, fish, and gather towards earning a moderate livelihood) in their traditional territories. The Supreme Court of Canada has also held that the Crown (including the Governments of Canada and New Brunswick) have a duty to consult with First Nations, and accommodate as necessary, when exercising a decision that may affect Aboriginal or treaty rights.

As an agent of the Crown, NB Power has the duty to conduct its business in a manner consistent with upholding the honour of the Crown. As such, it meaningfully engages and consults with potentially affected First Nations. The New Brunswick Department of Aboriginal Affairs is kept fully informed of the engagement and consultation activities, regularly attending meetings.

As NB Power is frequently required to engage and consult on multiple projects, it developed a strategy in 2013 titled "Strategic Approach for First Nations Affairs". The strategy focused on building long-lasting and trusted relationships between each Nation and NB Power that, in part, would support effective engagement and consultation of New Brunswick's Indigenous peoples in relation to NB Power's projects. In support of this strategy, NB Power also developed consultation agreements with the Wolastoqey Nation in New Brunswick (WNNB) and Mi'gmawe'l Tplu'taqnn Incorporated (MTI), and meets with them on a regular basis to provide updates on ongoing NB Power projects including the Nepisiguit Falls Generating Station Life Extension Project.

8.1 Overall Approach

NB Power has established the following objectives to ensure meaningful consultation is carried out and to satisfy the substantive and procedural aspects of the duty to consult:

1. Consult frequently with the First Nation communities that wish to be engaged through meaningful written updates and in person meetings, as requested, throughout the life of the Project;
2. Record concerns raised by First Nations throughout the process and consider appropriate mitigation measures to address the concerns where possible;
3. Communicate when and how mitigation measures have been applied to address comments and concerns that were raised by First Nations; and
4. Follow the guiding principles agreed to between each Nation, representative organization, or community and NB Power.

To effectively consult with First Nations on this Project, the approach is designed to be adaptive and inclusive. The approaches described below have been and will continue to be employed through the consultation process.

Direct Written Communication

Engagement of First Nations with respect to the Nepisiguit Falls Generating Station Life Extension Project was initiated on May 20, 2020. Each First Nation community was formally notified of the Project plans during the monthly consultation meeting between NB Power and the consultation representatives from each respective First Nation community. Further information on the Project including: an overview of the Project; the Project location; a summary of the Project components and activities; and contact information to whom questions, comments, and concerns could be forwarded was provided to the Nations, representative organizations, and consultation representatives on May 20, 2020, with follow up correspondence each month.

In-Person and Virtual Meetings

NB Power has been engaging with First Nation communities regarding the Project through in-person and regular virtual meetings since May 2020, and these meetings will continue. Meetings with MTI, WNNB, and their associated members are held approximately monthly (note that similar meetings are also held with the WNNB). During the meetings, Project updates are provided for various ongoing NB Power projects (including this Project), as well as the opportunity for questions in regards to the Project. All questions are recorded and responded to during these meetings, unless they required additional follow up at which time they are responded to in writing or added as a recurring agenda item until the comment has been addressed.

While NB Power meets routinely with Indigenous communities to keep them updated on their projects, most of these meetings have recently been held virtually due to the COVID-19 pandemic, and it is likely that virtual meetings will continue for some time.

NB Power is also open to having additional Project-specific meetings at the Nation or community's request as required. In this light, NB Power held an in-person community session and presentation at the Pabineau First Nation on July 22, 2021 to provide specific information regarding the planned scope and approach to the Project. As each meeting depends on the individual groups' interests, the content, location, meeting agendas, and formats are adapted to best suit the request.

Comments, questions or concerns raised at any in-person or virtual meeting have been and will continue to be recorded and responded to directly during the meeting if possible, or in writing at a later date when applicable.

Community Open House Events

NB Power recognizes that an effective means of disseminating information in Indigenous communities is by an open house style information session available to the community upon request. These information sessions provide a less formal way of providing information on specific items of concern to attendees through face-to-face interactions with NB Power staff.

If requested, NB Power would be pleased to host an information session in a First Nation community to provide additional Project information to interested community members, either in-person (if it safe to do so) or by virtual means (if the ongoing pandemic prevents in-person gatherings). During the meetings, verbal questions and comments will be recorded by Project representatives. In addition, paper forms and an email address will be made available for feedback on the Project to be submitted in writing if so desired.

Electronic Input

At the time of submission of the EIA Registration document to NBDELG, an electronic copy of the document will be provided to First Nation communities and their representative organizations. The document will also be available electronically on the NBDELG website (https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) and the NB Power Project website (https://www.nbpower.com/en/about-us/projects/nepisiguit-life-extension-project/).

Questions, comments, and concerns received in response to the EIA Registration will be recorded and responded to via writing or during a regularly scheduled meeting.

8.2 Engagement Activities Conducted to Date

In addition to its regular meetings with First Nations communities, as mentioned above, NB Power held a meeting and presentation at the Pabineau First Nation on July 22, 2021. Approximately 16 people from the community attended the event, including some representatives from MTI. A copy of the presentation delivered during the event is provided in **Appendix C**.

Future engagement efforts will be individualized to best suit each community or organization based on guidance from the consultation leaders.

8.3 Key Issues Identified to Date

Through the engagement efforts completed to date, First Nations have generally indicated support of the Nepisiguit Falls Generating Station Life Extension Project. Comments and questions have largely been related to specific components of the Project, and have generally included but are not limited to the following general areas as noted during the July 22, 2021 meeting at Pabineau First Nation:

- Concerns relating the lack of fish passage at the Station due to the natural waterfall, which limits fish species diversity upstream of the Station;
- Questions regarding the NB Power tendering process, opportunities for Indigenous businesses, and employment of First Nations personnel;
- Concerns regarding the relationship between Indigenous and non-Indigenous people, including Reconciliation;
- Questions regarding how the additional power generated by the Project, and whether it could be provided to First Nations on a priority basis at no cost;

- Questions regarding the composition of the bladders, and whether they will leach or otherwise release contaminants to the river;
- Concerns regarding the lack of warning when water is spilled beyond normal levels and potential for emergencies downstream of the Station (e.g., sudden flash of water posing a safety concern, potential flooding); and
- Presence of a white slimy substance on rocks adjacent to the river downstream (later determined to be didymo or “rock snot”, an invasive species).

As part of the consultation process, a database was created to track each comment, question, or concern as they are received. This database enables NB Power to track how the comments are addressed and what commitments are made. Comments, questions, and concerns raised by First Nations, unless confidential in nature, will be included in the Public Consultation Summary Report (without attribution, to protect personal information) which will be submitted to NBDELG for review within 60 days following registration of the Project.

8.4 Future Activities

NB Power is committed to continuing to share information on the Project and continue to consult with potentially affected First Nations throughout the duration of the Project. Although consultation efforts with each Nation will be customized and adaptable, it is anticipated that the efforts will include: written communication, personal communication, in-person and teleconference meetings, and open house style information sessions (either in-person or virtually if in-person meetings are not possible), if so desired by the host communities.

It is anticipated that as the Project progresses, Indigenous monitors will be engaged through invitation to participate in field activities and to provide oversight during the construction activities. Indigenous monitors participated in some of the bird and vegetation surveys conducted in the summer of 2021.

8.5 Consultation Log

NB Power’s consultation efforts will be recorded in a consultation log; however, as the log is confidential in nature, it will only be shared with the New Brunswick Department of Aboriginal Affairs as per agreements between NB Power and the First Nations.

Comments, questions, and concerns raised by First Nations, unless confidential in nature, will be included in the Public Consultation Summary Report which will be submitted to NBDELG for review within 60 days following registration of the Project.

9.0 Public and Stakeholder Consultation

The planned approach to public and stakeholder involvement in support of the EIA review of the Project is described in this section. In accordance with the EIA Regulation, direct communication with stakeholders (local residents, elected officials, service groups, businesses, etc.) is required, as a minimum.

9.1 Overall Approach

To effectively engage elected officials, landowners, stakeholders, and the general public on the Project, NB Power has initiated a multi-pronged approach based on the following objectives:

- Regularly inform stakeholders, community groups, and the general public on the Project through timely and meaningful information updates via direct communications and online platforms;
- Provide direct written communications with elected officials and stakeholder groups;
- Consult with affected members of the public and stakeholders in a timely manner in an effort to mitigate potential impacts, and to communicate when/how mitigation measures have been applied to address comments and concerns; and
- Provide the public and interested stakeholder groups with opportunities to learn more about the Project; and to share their issues and concerns about the Project so that they may be addressed as part of the EIA review process.

To ensure that stakeholders are effectively engaged in the Project, the approach is designed to be adaptive and inclusive through a variety of different communication platforms and methods. The following platforms and methods will be deployed throughout the engagement process.

- <u>News Releases:</u>
  - NB Power recognizes that modern communication techniques are required to effectively reach a large demographic of the general public and has utilized its significant corporate social media profile to reach New Brunswickers. As part of the public and stakeholder engagement process, NB Power has posted and will continue to post news releases on the NB Power website and links to news releases on its social media platforms (with over 17,500 followers).
- <u>Project Webpage:</u>
  - NB Power has launched a Project-specific webpage (https://www.nbpower.com/en/about-us/projects/nepisiguit-life-extension-project/) which contains information on the Project background, benefits of life extension, the proposed Project schedule, and a hyperlink to the Project-specific email link. A virtual open house presentation from July 20, 2021, and a question and answer document, are also available on the Project webpage as well as in **Appendix C** of this document.

- Direct Written Communications:
    - Direct written communications describing the Project and the anticipated environmental effects and mitigation have been and will continue to be provided to elected federal, provincial, and municipal officials and regulatory agencies. Comments and questions received from elected officials and stakeholders have been, and will continue to be, recorded and responded to in a timely manner.
- Public Viewing of the EIA Registration Document:
    - The EIA Registration document will be made available on the NBDELG website (https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html l) and the NB Power Project website (https://www.nbpower.com/en/about-us/projects/nepisiguit-life-extension-project/).
- Community/Stakeholder Meetings:
    - NB Power will attend community meetings (either in-person or virtually) if requested, and will provide additional information on the Project to interested stakeholder groups at their request.
- Open Houses or Other Meetings:
    - Open house style information sessions have been and will continue to be conducted in the local community to provide additional Project information to interested stakeholders and the public, assuming it is safe to do so. In light of the ongoing COVID-19 pandemic, it is likely that public and stakeholder engagement that might occur in the foreseeable future will be held virtually, as required. NB Power held a virtual public open house on July 20, 2021 to provide information about the scope and approach to the Project and the EIA; approximately 42 people attended the event (i.e., 35 participants in the English feed, and 7 participants in the French feed).
    - During these sessions, verbal questions and comments have been and will continue to be recorded by Project representatives.
    - In addition, forms have been and will continue to be made available to the public for written feedback on the Project.
    - An email address is available for attendees who would like to submit questions or comments.

9.2 Engagement Activities Conducted to Date

During the period leading up to the registration of the Project, NB Power held one virtual public open house to provide Project information and explore potential areas of concern. The key engagement activity conducted to date is summarized in **Table 9.2.1** below.

Table 9.2.1: List of Key Public and Stakeholder Engagement Activities Completed to Date

Engagement Activity	Date Completed	Intended Audience
Virtual Open House	July 20, 2021	General Public

Samples of the communications materials such as a news release, direct written communication, and the information provided during the July 2021 open house is attached in **Appendix C**.

9.3 Key Issues Identified to Date

As part of the public and stakeholder engagement process, a database was created to track each comment, question, or concern as they are received. The database also enables NB Power to track how each comment, question, or concern is being addressed and what commitments were made. A high-level summary of the key questions, comments, and concerns received as of November 2021 is presented below in **Table 9.3.1**.

Table 9.3.1: Feedback from the Public and Stakeholders on the Project as of November 2021

Comment Type	Summary of Issues Raised
General	• Why not simply decommission the Station? • How many customers currently rely on the Station? • What is the estimated cost of this project? • How long is the bypass road?
Tendering and Procurement	• Will the Project be tendered out in phases and when approximately will tenders start going out? • Will the replacements of units 1, 2, and 3 be performed under NB Power's existing agreements, or will this work be done through public tenders?
Employment	• How many people are currently employed at the Station?
Consultation and Engagement	• Is this open house a consultation or a presentation? • Have the people of Pabineau First Nation been consulted specifically regarding this Project?
Engineering	• What is causing damage to the bladders? Just environmental degradation? • Will the scroll cases be replaced or is it part of the penstock refurbishment?
Water Quality	• What will be the duration of the temporary drainage and water quality problems in the basin?
EIA and Permitting	• What are the ecological impacts of the bypass road? Will this be considered in the EIA? • With this life extension project extending over several years, will the approval process happen in stages?

Responses to the questions listed in **Table 9.3.1** above are provided in **Appendix C**.

9.4 Future Activities

NB Power remains committed to engaging the public and key stakeholders on this Project throughout its duration. Future engagement activities will continue to follow the objectives outlined above. It is anticipated that the ongoing consultation activities will involve: news releases providing updates on the Project; open houses/information sessions (virtually where necessary); attendance at community/stakeholder meetings (virtually where necessary); continued response to questions, comments and concerns as they arise; and continued written communication with elected officials, regulators and stakeholder groups.

In accordance with the EIA Guide (NBDELG 2018), NB Power will provide a summary report documenting the engagement efforts and feedback received during the first 45 days following submission of the EIA Registration document to the NBDELG. The report will be submitted to NBDELG for review within 60 days following registration of the Project, so that the information can be considered in the course of decision-making in respect of the Project.

10.0 Other Information

This EIA Registration document includes other relevant documents as Appendices A to C of this document. Other than this EIA Registration document and the appended information, there are no additional Project-related documents that are publicly accessible.

10.1 Project-Related Documents

Other than this EIA Registration document, there are no Project-related documents that are publicly accessible.

10.2 Approval of the Undertaking

Following completion of the EIA review for the Project and the receipt of a Certificate of Determination, a number of other authorizations, approvals, permits, licences, or leases may be required from provincial or federal agencies. Refer to **Section 1.4** of this document for more information in this regard.

10.3 Funding

At this time, it is anticipated that the Project will be funded entirely by NB Power, and does not currently involve the receipt of any funds, loans, loan guarantees, land transfers, or other types of financial support from any federal or provincial government department or agency. NB Power may consider pursuing funding from available government funding programs at a future time, if appropriate.

10.4 Signature

This document is submitted on behalf of the New Brunswick Power Corporation.

2021/12/10

R. Matthew Gorman, P.Eng.
Senior Technical Specialist - Environment

Date of Signature

[This page was intentionally left blank]

11.0 Summary and Conclusion

This environmental impact assessment (EIA) registration document describes the proposed approach to extending the service life of the Nepisiguit Falls Generating Station (the Station) proposed by the New Brunswick Power Corporation (NB Power) in the community of Bathurst Mines, New Brunswick. The Station is a 10.8 megaWatt (MW) hydroelectric generating station located on the Nepisiguit River, in northern New Brunswick. The Station began operation in 1921 and certain elements of the Station are aging and nearing the end of their useful life. The Nepisiguit Falls Generating Station Life Extension Project (the Project) consists of a multi-faceted life extension project at the Station to extend its service life by another 50 years, including various components aimed at modernizing, repairing, and replacing various components at the Station in phased approach between 2022 and approximately 2030.

This document is being submitted to the New Brunswick Department of Environment and Local Government (NBDELG) as part of the EIA process under the New Brunswick *Environmental Impact Assessment Regulation 87-83* of the *Clean Environment Act*. A federal impact assessment (IA) under the federal *Impact Assessment Act* is not required for the Project.

Although engineering design refinements are ongoing, the Project components include one or more of the following:

- Phase 1 – Turbine-Generator Unit Replacements: Replacement of one or more of the three aging turbine-generator units at the Station with modern DIVE-HAX-Turbines;
- Phase 2 – Forebay Bridge Replacement or Repair: Repair or replacement of the forebay bridge that extends from the north shore of the river to the centre platform, over the Nepisiguit River;
- Phase 3 – Sluiceway Bladder and Forebay Bladder Replacements: Replacement of the two rubber bladder dams that sit atop the concrete dam structure whose purpose is to raise water elevations in the impoundment compared to with the concrete dam structure alone; and
- Phase 4 – Structural Repairs to the Powerhouse, Forebay, and Tailrace Concrete Structures: Conducting structural repairs to one or more walls of the powerhouse's building envelope, forebay, and other components.

In accordance with the requirements the New Brunswick *Environmental Impact Assessment Regulation–Clean Environment Act*, this EIA Registration document provided Project-related information available at the early stage of its engineering design, and has assessed the environmental interactions of the Project. The key elements of this report are as follows:

- A description of the proposed components of the Project was provided, including a discussion of how the Project would be carried out. Project-related emissions and wastes were also described.

- A high-level summary of the environmental setting for the Project was provided to introduce general physical, biological, and socioeconomic conditions applicable in the general area of the Project.
- The scope of the EIA, including the scope of the Project, factors to be considered, and scope of those factors were described. The methods that were to be used to conduct the assessment of interactions between the Project and various valued components (VCs) were discussed.
- An assessment of potential interactions of the Project on each VC of relevance and importance to this EIA was conducted. Ten VCs were identified as relevant and important to the EIA of the Project: atmospheric environment; acoustic environment; groundwater; surface water; fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, socioeconomic environment; heritage resources; and traditional land and resource use. Additionally, effects of the environment on the Project, as well as accidents, malfunctions, and unplanned events, were assessed. Where applicable, follow-up or monitoring measures to verify the predictions of this EIA or to verify the effectiveness of mitigation were identified.
- Planned Indigenous and public engagement activities in respect of the Project were described.

The assessment of interactions between the Project and the various VCs concluded that there would be no significant substantive interactions expected from the Project activities in consideration of normal activities of the Project as planned. Effects of the environment on the Project were predicted to not be substantive. The potential residual environmental effects of accidents, malfunctions, and unplanned events were also found to be not substantive.

Overall, based on the results of this EIA Registration, it is concluded that, with planned mitigation and the implementation of best practices to avoid or minimize adverse environmental interactions, the residual environmental interactions between the Project and all VCs, including the effects of the environment on the Project and from accidents, malfunctions and unplanned events, during all Project activities are not expected to be substantive.

12.0 Closing

This report was prepared by Dillon Consulting Limited (Dillon) on behalf of New Brunswick Power Corporation. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report has been prepared by a team of Dillon professionals on behalf of New Brunswick Power Corporation.

Respectfully submitted,

DILLON CONSULTING LIMITED

Denis L. Marquis, M.Sc.E., P.Eng.
Associate, Project Manager

[This page was intentionally left blank]

13.0 References

13.1 Literature Cited and Internet Sites

AC CDC (Atlantic Canada Conservation Data Centre). 2021. Data Report 6801: Nepisiguit, NB. February 2021 Data Request.

Adams, J. and S. Halchuk. 2003. Fourth generation seismic hazard maps of Canada: Values for over 650 Canadian localities intended for the 2005 National Building Code of Canada. Geological Survey of Canada Open File 4459 pp. 1-155.

AER (Alberta Energy Regulator). 2007. *Directive 38: Noise Control*. Edmonton, Alberta. Available at: http://www.aer.ca/documents/directives/Directive038.pdf. Accessed: September 2021.

Archaeological Services. 2012. *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick*. Archaeological Services Branch, New Brunswick Department of Tourism, Heritage and Culture, Fredericton, NB.

Armstrong, T. (E.R.). 2014. Management Plan for the Bald Eagle (*Haliaeetus leucocephalus*) in Ontario. Ontario Management Plan Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 53 pp.

Basham, P.W. and J. Adams. 1984. The Miramichi, New Brunswick earthquakes: near surface thrust faulting in the northern Appalachians. Geoscience Canada, 11, pp. 115-121.

BSC (Bird Studies Canada). 2020a. *Second Atlas of the Breeding Birds of the Maritime Provinces: Roadside Point Count Coordinates for Square 20KT85* Available at: https://www.mba-aom.ca/maps/pdf/20KT85.pdf. Accessed: September 2021.

BSC (Bird Studies Canada). 2020b. *Important Bird Areas – Caraquet Region*. Available at: https://www.ibacanada.com/site.jsp?siteID=NB005. Accessed: September 2021.

Burrell, B.C. and J.E. Anderson. 1991. Regional Hydrology of New Brunswick, Canadian Water Resources Journal, 16:4, 317-330, DOI: 10.4296/cwrj1604317.

CBC (Canadian Broadcasting Corporation). 2007. NB Power buys generating station. Available at: https://www.cbc.ca/news/canada/new-brunswick/nb-power-buys-generating-station-1.656694. Accessed: September 2021.

CDA (Canadian Dam Association). 2008. NB Power Buys New Generating Station. Canadian Dam Association Bulletin, Spring 2008 edition, pp. 19-20.

CER (Canada Energy Regulator). Provincial and Territorial Energy Profiles – New Brunswick. Available at: https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-new-brunswick.html. Accessed: August 2021.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007a. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007b. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 25 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007c. COSEWIC assessment and status report on the Olive-sided Flycatcher *Contopus cooperi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 25 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2009. COSEWIC assessment and update status report on the Maritime Ringlet (*Coenonympha nipisiquit*) in Canada. Ottawa. vii + 34 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2010. *COSEWIC assessment and status report on the Atlantic Salmon Salmo salar in Canada*. Ottawa. xlvii + 136.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 37 pp. Available at: www.registrelep-sararegistry.gc.ca/default_e.cfm. Accessed: September 2021.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012a. *COSEWIC assessment and status report on the American Eel Anguilla rostrata in Canada*. Ottawa. xii + 109 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012b. *COSEWIC assessment and status report on the Striped Bass Morone saxatilis in Canada*. Ottawa. iv + 82 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012c. COSEWIC assessment and status report on the Eastern Wood-pewee *Contopus virens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 39 pp.

CRI (Canadian Rivers Institute). 2021. *Inland Fish Species of New Brunswick*. Available at: https://www.unb.ca/research/institutes/cri/links/inlandfishesnb/Species/index.html. Accessed: September 2021.

CRM (Cultural Resource Management Group Limited). 2021. *Nepisiguit Falls Generating Station Upgrade Project, Achaeological Impact Assessment – Preliminary Invesitgation Bathurst Mines New Brunswick Draft Report*. Prepared for the New Brunswick Power Corporation and the Heritage and Archeaological Services Branch of the New Brunswick Department of Tourism, Heritage, and Culture.

DFO (Department of Fisheries and Oceans Canada). 1990. *Underwater World: The American Shad*. Government of Canada. Minister of Supply and Services Canada. Cat. No. Fs 41-33/49-1990E. ISBN 0-662-17561-1.

DFO (Department of Fisheries and Oceans Canada). 2001. *Gaspereau Maritime Provinces Overview*. DFO Science Stock Status Report D3-17. 2001.

DFO (Department of Fisheries and Oceans Canada). 2018. *The baitfish primer*. Available at: https://www.dfo-mpo.gc.ca/species-especes/publications/baitfish-poissons-appats/page08-eng.html. Accessed: September 2021.

DFO (Department of Fisheries and Oceans Canada). 2019. *Introducing Canada's modernized Fisheries Act*. Available at: https://www.dfo-mpo.gc.ca/campaign-campagne/fisheries-act-loi-sur-les-peches/introduction-eng.html. Accessed: September 2021.

DIVE-Turbinen. 2021. DIVE-Turbines for Low Head and Medium Head Applications. DIVE Turbinen GmbH & Co.KG, Amorbach, Germany. Available at: https://www.dive-turbine.de/hydropower/DIVE-Turbine. Accessed: September 2021.

ECCC (Environment and Climate Change Canada). 2017. Saint John River Floods From Top to Bottom. Available at: https://ec.gc.ca/meteo-weather/default.asp?lang=En&n=7D6FDB7C-1. Accessed: July 2021.

ECCC (Environment and Climate Change Canada). 2020a. *Canada's Greenhouse Gas Inventory*. Available at: https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html. Accessed: August 2021.

ECCC (Environment and Climate Change Canada). 2020b. *General Nesting Periods of Migratory Birds*. Available at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html. Accessed: September 2021.

Environment Canada. 2013. Recovery Strategy for the Cobblestone Tiger Beetle (*Cicindela marginipennis*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. v + 17.

Gilhen, J. 1974. *The Fishes of Nova Scotia's Lakes and Streams*. Nova Scotia Museum. Halifax, Nova Scotia. ISBN 0-919680-01-1.

Glendenning, B. and C. Dale. 2019. Canadian Encyclopedia Article: Bathurst. Funded by the Government of Canada. Available at: https://thecanadianencyclopedia.ca/en/article/bathurst. Accessed: September 2021.

GNB (Government of New Brunswick). 2011. *Government of New Brunswick, Duty to Consult Policy.* New Brunswick Aboriginal Affairs Secretariat. November 2011.

GNB (Government of New Brunswick). 2012. Transportation and Infrastructure: Maximum Gross Vehicle Weights Highway Map. Available at: https://www2.gnb.ca/content/gnb/en/departments/dti/highways_roads/content/maps.html. Accessed: September 2021.

GNB (Government of New Brunswick). 2017. Ice Storm Review 2017 New Brunswick – January 2017. Available at: https://www2.gnb.ca/content/dam/gnb/Departments/eco-bce/Promo/ice_storm_meetings/PDFs/ice_storm_review-e.pdf. Accessed: August 2021.

GNB (New Brunswick Department of Tourism, Heritage and Culture). 2020. *Heritage Conservation Act Summary.* Available online at: https://www2.gnb.ca/content/gnb/en/departments/thc/heritage/content/heritage_conservationact.html. Accessed: September 2021.

GOC (Government of Canada). 2021a. Canadian Climate Normals 1981-2010 Station Data: Nepisiguit Falls, New Brunswick. Available at: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=Nepisiguit&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=6213&dispBack=1. Accessed: August 2021.

GOC (Government of Canada). 2021b. Canadian Climate Normals 1981-2010 Station Data: Bathurst A New Brunswick. Available at: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProv&lstProvince=NB&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=6916&dispBack=0. Accessed: August 2021.

Goddard, I. 1996. *Native languages and language families of North America. In Goddard, Ives (ed.), Handbook of North American Indians*. Volume 17: Languages. Washington: Smithsonian Institute. (Map accompanying the handbook).

Health Canada. 2017. *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise*. Ottawa, Ontario. Available at: https://www.ceaa.gc.ca/050/documents/p80054/119378E.pdf. Accessed: September 2021.

Health Canada. 2020. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document — Escherichia coli. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. (Catalogue No. H129-27/2020E-PDF). Available at: https://www.canada.ca/content/dam/hc-sc/documents/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-escherichia-coli/e-coli-eng.pdf. Accessed: July 2021.

Hinds, H.R. 2000. *Flora of New Brunswick.* Second Edition. University of New Brunswick Press, Fredericton, NB.

INAC (Indigenous and Northern Affairs Canada). 2021. *Welcome to the First Nation Profiles Interactive Map*. Available at: https://geo.aadnc-aandc.gc.ca/cippn-fnpim/index-eng.html. Accessed: August 2021.

IPCC (Intergovernmental Panel on Climate Change). 2014. Climate Change 2014: Synthesis Report. Available at: http://www.ipcc.ch/report/ar5/syr/. Accessed: July 2021.

Kircheis, F.W. 2004. *Sea Lamprey: Petromyzon marinus Linnaeus 1758*. Carmel, Maine. F.W. Kircheis L.L.C.

Langton, J.P. and S.R. McCutcheon. 1993. Brunswick Project, NTS 21 P/5 West, 21 P/4 West, Gloucester County, New Brunswick. In: S.A. Abbott (ed.), Current Research. New Brunswick Department of Natural Resources and Energy, Mineral Resources, Information Circular 93-1, pp. 31-51.

Lutzac, T.G. 1983. *Assessment of the Nepisiguit River Salmon Stock in 1983*. Department of Fisheries and Oceans. Available at: https://publications.gc.ca/collections/collection_2020/mpo-dfo/Fs70-8-84-2-eng.pdf. Accessed: September 2021.

MacMillan, J.L., D. Caissie, J.E. LeBlanc, and T.J. Crandlemere. 2005. *Characterization of summer water temperatures for 312 selected sites in Nova Scotia*. Canadian Technical Report of Fisheries and Aquatic Sciences 2582: 43.

McCarthy, A. J. 1999. Chapter 5 The Harnessing of the Great Falls. In Historic Bathurst on the Bay of Chaleur. Nimbus Pub. Halifax, N.S. pp 85-88. Available at https://archive.org/details/historicbathurst0000mcca/page/88/mode/1up Accessed: August 2021.

Munro, M.C., R.E. Newell, and N.M. Hill. 2014. *Nova Scotia Plants*. Nova Scotia Museum. Halifax, NS.

NASA (North American Space Agency). 2017. What's the Difference between Weather and Climate? Available at: https://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html. Accessed: July 2021.

Natural Resources Canada. 2021a. Earthquake Zones in Eastern Canada. Available at: http://www.seismescanada.rncan.gc.ca/zones/eastcan-en.php. Accessed: July 2021.

Natural Resources Canada. 2021b. Search the Earthquake Database. Available at: https://www.seismescanada.rncan.gc.ca/stndon/NEDB-BNDS/bulletin-en.php. Accessed: July 2021.

Natural Resources Canada. 2021c. Canadian Wildland Fire Information System: Canadian Forest Fire Index (FWI) System. Available at: http://cwfis.cfs.nrcan.gc.ca/background/summary/fwi. Accessed: July 2021.

NAV Canada. 2001. The Weather of Atlantic Canada and Eastern Quebec. Accessed at: https://www.navcanada.ca/en/lawm-atlantic-en.pdf. Accessed: July 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2018. A Guide to Environmental Impact Assessment in New Brunswick. Environmental Impact Assessment Branch, Fredericton, NB. January 2018. Available at: https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf. Accessed: September 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2021a. 2019 Air Quality Monitoring Results. Environment Reporting Series, Department of Environment and Local Government, Fredericton, NB. 2021. Available at: https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Air-Lair/AirQuality-QualiteDeLair/air-quality-monitoring-results-2019.pdf. Accessed: August 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2021b. 2019 Air Quality Monitoring Results – Supplementary Data. Environment Reporting Series, Department of Environment and Local Government, Fredericton, NB. 2021. Available at: https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Air-Lair/AirQuality-QualiteDeLair/supplementary-data-2019.pdf. Accessed: August 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2021c. New Brunswick Online Well Log System. Available at: https://www.elgegl.gnb.ca/0375-0001/. Accessed: July 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2021d. Flood History Database. Available at: https://www.elgegl.gnb.ca/0001/en/Flood/Search. Accessed on August 2021.

NBDELG (New Brunswick Department of Environment and Local Government). 2021e. *Department of Environment and Local Government River Water Quality Data*. Available at: https://www.elgegl.gnb.ca/WaterNB-NBEau/en/SamplingLocation/Details/582. Accessed: September 2021.

NBDNR (New Brunswick Department of Natural Resources). 2004. Guidelines for Roads and Watercourse Crossings. Forest Management Branch, New Brunswick Department of Natural Resources, Fredericton, NB. April 20, 2004. Available at: https://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Publications/Roads-WatercourseCrossings.pdf. Accessed: September 2021.

NBDNR (New Brunswick Department of Natural Resources) 2008. Bedrock Geology of New Brunswick. Minerals. Policy and Planning Division. Map NR-1 (2008 Edition). Scale 1:500,000 (Revised December 2008). Available at: https://www2.gnb.ca/content/dam/gnb/Departments/en/pdf/Minerals-Minerales/Bedrock_Geology_MapNR1-e.pdf. Accessed: July 2021.

NBDNRED-NBDELG (New Brunswick Department of Natural Resources and Energy Development and New Brunswick Department of Environment and Local Government). 2002. *New Brunswick Wetlands Conservation Policy*. Government of New Brunswick. Available online at https://www2.gnb.ca/content/d am/gnb/Departments/env/pdf/Wetlands-TerreHumides/WetlandsTerre sHumides.pdf. Accessed: August 2021.

NBDNRED (New Brunswick Department of Natural Resources and Energy Development). 2021. *General Status of Wild Species*. Available at: https://www2.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/GeneralStatusWildSpecies.html. Accessed: September 2021.

NB Power (New Brunswick Power Corporation). 2020. Nepisiguit Generating Station Upgrade Project Introduction. Prepared by NB Power. November 16, 2020 (Updated June 2021).

NMTP (Nepisiguit Mi'gmaq Trail Partnership). 2020. Trail History. Available at: https://www.migmaqtrail.ca/en/trail-history. Accessed: September 2021.

NTNB (Nature Trust of New Brunswick). 2018. *Wetlands: A New Brunswick Guide*. The Nature Trust of New Brunswick Inc. [ISBN 978-0-9683698-6-9].

O'Connell, R. No Date. Great Falls Dam, Nepisiguit River. Nepisiguit Centennial Museum & Cultural Centre Bathurst, New Brunswick. Available at: http://www.virtualmuseum.ca/sgc-cms/histoires_de_chez_nous-community_stories/pm_v2.php?id=record_detail&lg=English&ex=00000429&rd=111126&hs=0. Accessed: September 2021.

Page, L.M. and B.M. Burr, 1991. *A field guide to freshwater fishes of North America north of Mexico*. Houghton Mifflin Company, Boston.

Peterson, R. T. 2002. Birds of Eastern and Central North America. Fifth Edition. Peterson Field Guides. Houghton Mifflin Company, Boston, USA.

PFN (Pabineau First Nation). 2020. Counting Fence 2020. Available at: https://pabineaufirstnation.ca/index.php/natural-resources/counting-fence-2020/. Accessed: August 2021.

PNS (Peskotomuhkati Nation at Skutik). 2021. *About Treaties*. Available at: https://qonaskamkuk.com/peskotomuhkati-nation/about-treaties/. Accessed September 2021.

Rampton, V.N., 1984. Generalized surficial geology map of New Brunswick, Department of Natural Resources and Energy, Minerals, Policy and Planning Division. NR-8 (Scale 1:500 000).

Sable, T. and B. Francis. 2012 The Language of this Land, Mi'kma'ki. Sydney: Cape Breton University Press, page 22.

Sibley, D. 2016. Sibley Birds East. Second Edition. Random House of Canada Limited, Toronto.

SNMT (Sentier Nepisiguit Mi'gmaq Trail). 2021. Vision and History. Available at: https://www.migmaqtrail.ca/mission-history.php. Accessed September 2021.

Statistics Canada. (2017). Bathurst, P [Census subdivision], New Brunswick and New Brunswick [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. Available at: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E. Accessed: September 2021.

Stewart, R.L.M., A. Bredin, A.R. Couturier, A.G. Horn, D. Lepage, S. Makepeace, P.D. Taylor, M.-A. Villard, and R.M. Whittam (eds). 2015. *Second Atlas of Breeding Birds of the Maritime Provinces*. Bird Studies Canada, Environment Canada, Natural History Society of Prince Edward Island, Nature New Brunswick, New Brunswick Department of Natural Resources, Nova Scotia Bird Society, Nova Scotia Department of Natural Resources, and the Prince Edward Island Department of Agriculture and Forestry. Sackville, New Brunswick. Available at: https://www.mba-aom.ca/jsp/toc.jsp#. Accessed: September 2021.

USDOT (United States Department of Transportation). 2006. *FHWA (Federal Highway Administration) Roadway Construction Noise Model User's Guide.* (FHWA0HEP-05-054), Washington, DC. Available at: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/handbook/handbook12.cfm. Accessed: September 2021.

USEPA (United States Environmental Protection Agency). 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (Report No. 550/9-74-004). Washington, DC. Available at: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000L3LN.TXT. Accessed: September 2021.

Vashon, J. 2016. *Lynx canadensis*. Available at: http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T12518A101138963.en. Accessed: September 2021.

White, K. 2020. 80K salmon fry released into Nepisiguit River as North American returns continue to plummet. Available at: https://www.iheartradio.ca/max-104-9/news/80k-salmon-fry-released-into-nepisiguit-river-as-north-american-returns-continue-to-plummet-1.12805655. Accessed: August 2021.

White, R.T. 1871. Chiploquorgan, or, Life by the camp fire in Dominion of Canada and Newfoundland. Chapter 1-4: pp. 1-49. Available at: https://www.canadiana.ca/view/oocihm.54510/53?r=0&s=1. Accessed: August 2021.

WHO (World Health Organization). 1999. *Guidelines for Community Noise*. Editor: Berglund, B., T. Lindvall, and D.H. Schwela. 2020. Available at: https://www.who.int/docstore/peh/noise/Comnoise-1.pdf. Accessed: September 2021.

Wilson, R.A., 2014. Geology of Nepisiguit Falls area (NTS 21 P/05f). Gloucester Country. New Brunswick. New Brunswick Department of Energy and Mines. Geological Surveys Branch. Plate 2014-15.

Zelazny, V.F. (ed.). 2007. *Our landscape heritage - The story of ecological land classification in New Brunswick*. New Brunswick Dept. Natural Resources. Available at: https://www2.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/ForestsCrownLands/content/ProtectedNaturalAreas/OurLandscapeHeritage.html. Accessed: August 2021.

13.2 Personal Communications

Baker, Robert. 2021. Past President, Nepisiguit Salmon Association.

Glynn, Mark. 2012. Manager, Permitting (South) Section, New Brunswick Department of Environment and Local Government, Fredericton, NB.

Kryszko, Robert. 2021. Special Projects and Programs Coordinator, Pabineau First Nation.

Perlot, Stefan. 2021. Chief Technology Officer, Bridge Executive.

Appendix A

AC CDC Data Report No. 6801, (Nepisiguit), NB

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

DATA REPORT 6801: Nepisiguit, NB

Prepared 21 February 2021
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 (AC CDC; www.accdc.com) 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 AC CDC 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 AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC 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 AC CDC 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
NepisiguitNB_6801ob.xls	Rare or legally-protected Flora and Fauna in your study area
NepisiguitNB_6801ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
NepisiguitNB_6801msa.xls	Managed and Biologically Significant Areas in your study area
NepisiguitNB_6801ff_py.xls	Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC 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 AC CDC 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 AC CDC 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) AC CDC 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) AC CDC 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 AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

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

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
john.klymko@accdc.ca

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (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 Hubert Askanas, Energy and Resource Development: (506) 453-5873.

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 Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 890-1046
Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@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

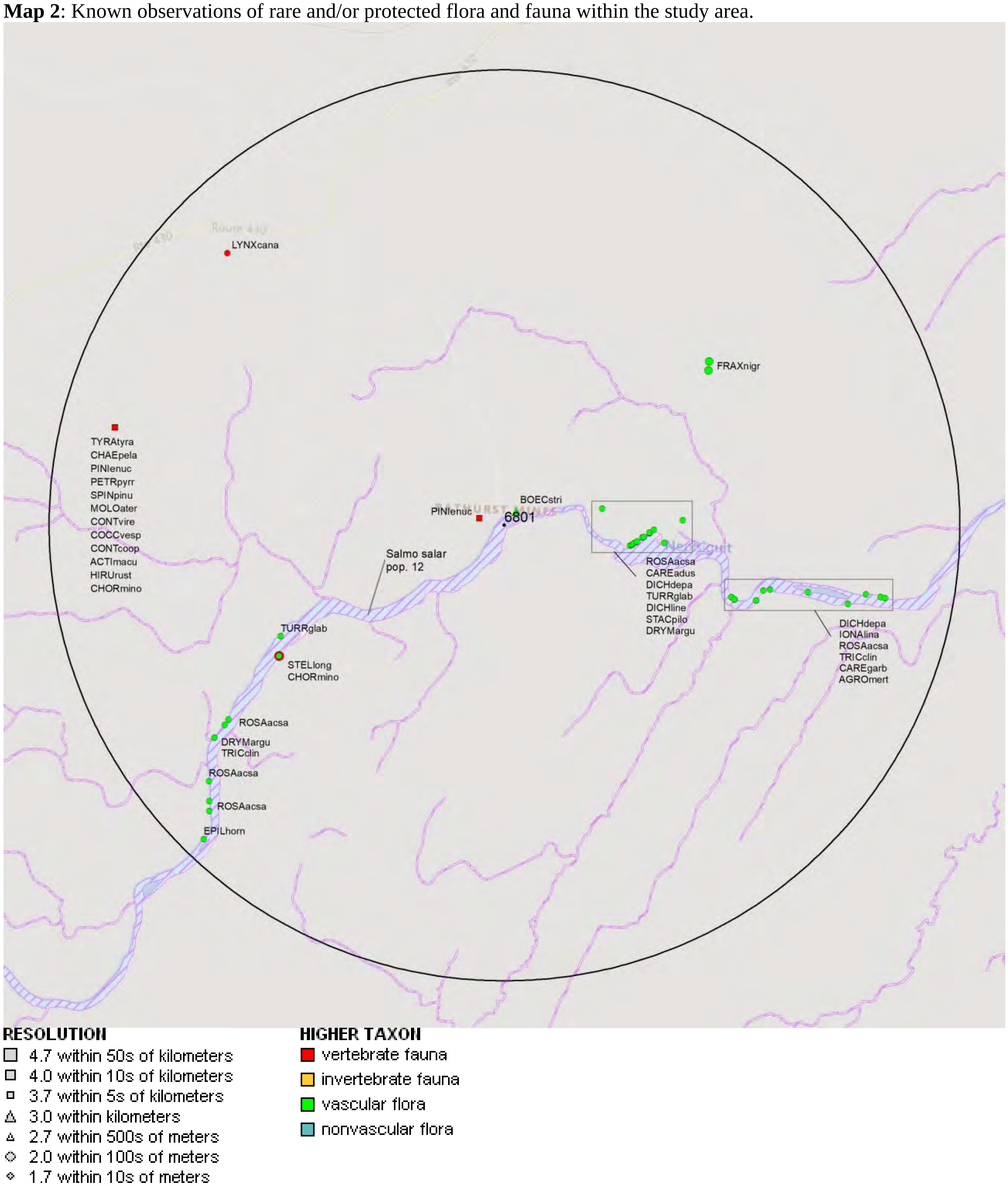
2.1 FLORA

The study area contains 45 records of 15 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 22 records of 13 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within 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 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *msa.xls).

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

4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study 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	# recs	Distance (km)
P	*Fraxinus nigra*	Black Ash	Threatened			S4S5	2	2.8 ± 0.0
P	*Ionactis linariifolia*	Flax-leaved Aster				S2	2	2.6 ± 0.0
P	*Boechera stricta*	Drummond's Rockcress				S2	1	0.2 ± 1.0
P	*Stellaria longifolia*	Long-leaved Starwort				S2	1	2.9 ± 0.0
P	*Rosa acicularis ssp. sayi*	Prickly Rose				S2	18	1.1 ± 0.0
P	*Agrostis mertensii*	Northern Bent Grass				S2	1	3.9 ± 0.0
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	1	1.4 ± 0.0
P	*Carex adusta*	Lesser Brown Sedge				S2S3	1	1.6 ± 0.0
P	*Turritis glabra*	Tower Mustard				S3	7	1.4 ± 0.0
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	1	4.8 ± 0.0
P	*Carex garberi*	Garber's Sedge				S3	1	2.9 ± 0.0
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	2	2.9 ± 0.0
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4	1.4 ± 0.0
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	1	2.0 ± 0.0
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	2	1.6 ± 0.0

4.2 FAUNA

	Scientific ***Name***	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3	4.4 ± 7.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1	4.4 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1	4.4 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	1	4.4 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	3	2.9 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	2	4.4 ± 7.0
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1	4.3 ± 0.0
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	2	0.3 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	1	4.4 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	1	4.4 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	1	4.4 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	1	4.4 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4	4.4 ± 7.0

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 your study area are indicated below with “YES”.

New Brunswick

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the 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 or bat species occurrence		[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 AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
42	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
15	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
6	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2	Sabine, M. 2016. Black Ash records from the NB DNR Forest Development Survey. New Brunswick Department of Natural Resources.
1	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
1	Dept of Fisheries & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.
1	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
1	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. https://doi.org/10.1037/arc0000014.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 23444 records of 141 vertebrate and 1027 records of 61 invertebrate fauna; 6999 records of 306 vascular, 676 records of 139 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 (including “location-sensitive” species). 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	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	2	82.3 ± 1.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	2656	29.5 ± 0.0	NB
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	4	56.7 ± 1.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	25	98.8 ± 0.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	333	28.2 ± 0.0	NB
A	*Pagophila eburnea*	Ivory Gull	Endangered	Endangered		SNA	1	77.4 ± 0.0	NB
A	*Empidonax virescens*	Acadian Flycatcher	Endangered	Endangered		SNA	1	68.3 ± 0.0	NB
A	*Delphinapterus leucas*	Beluga Whale - St Lawrence Estuary pop.	Endangered	Endangered		SNA	2	75.4 ± 1.0	NB
A	*Salmo salar pop. 7*	Atlantic Salmon - Outer Bay of Fundy pop.	Endangered		Endangered	SNR	1	86.2 ± 0.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	6	51.6 ± 5.0	NB
A	*Leucoraja ocellata pop. 5*	Winter Skate - Gulf of St Lawrence pop.	Endangered		Endangered		4	70.4 ± 0.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	4	47.6 ± 7.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1	63.5 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	52	21.5 ± 7.0	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	42	32.9 ± 7.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	569	4.4 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B,S2M	672	38.3 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	601	19.1 ± 0.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	249	4.4 ± 7.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	590	10.6 ± 7.0	NB
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	439	5.8 ± 7.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	490	21.5 ± 7.0	NB
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3S4M	229	29.5 ± 0.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	13	14.4 ± 0.0	NB
A	*Vermivora chrysoptera*	Golden-winged Warbler	Threatened	Threatened		SNA	1	68.5 ± 1.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	2	82.4 ± 0.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	10	27.0 ± 7.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	13	34.9 ± 0.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	47	24.3 ± 5.0	NB
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe - Southern Gulf of St Lawrence pop.	Special Concern		Special Concern	S2S3	2106	25.9 ± 1.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	2	48.7 ± 0.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	177	8.7 ± 0.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	462	4.4 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	434	4.4 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	339	2.9 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	4	68.5 ± 1.0	NB
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern		Special Concern	S4	4	62.1 ± 0.0	NB
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4	8	88.1 ± 1.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	339	4.4 ± 7.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	3	67.6 ± 3.0	NB
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	3	57.4 ± 0.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	9	56.9 ± 20.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	13	24.3 ± 5.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	4	44.5 ± 3.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	7	48.1 ± 0.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	12	31.9 ± 7.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	22	62.4 ± 1.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk			S2B,S2M	9	48.1 ± 0.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	5	90.6 ± 7.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	2	53.7 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	52	4.3 ± 0.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	635	25.4 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	7	47.5 ± 0.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	1	96.8 ± 0.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	392	1.6 ± 0.0	NB
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	1	93.5 ± 100.0	NB
A	*Puma concolor pop. 1*	Eastern Cougar	Data Deficient		Endangered	SNA	44	19.2 ± 1.0	NB
A	*Morone saxatilis*	Striped Bass	E,SC			S3	20	46.2 ± 10.0	NB
A	*Odobenus rosmarus pop. 5*	Atlantic Walrus - Nova Scotia-Newfoundland-Gulf of St. Lawrence population (DU3)	X			SX	4	61.4 ± 1.0	NB
A	*Thryothorus ludovicianus*	Carolina Wren				S1	4	47.3 ± 0.0	NB
A	*Salvelinus alpinus*	Arctic Char				S1	10	52.8 ± 1.0	NB
A	*Synaptomys borealis sphagnicola*	Northern Bog Lemming				S1	4	45.0 ± 1.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	716	24.2 ± 0.0	NB
A	*Aythya americana*	Redhead				S1B,S1M	2	48.1 ± 0.0	NB
A	*Antigone canadensis*	Sandhill Crane				S1B,S1M	5	62.8 ± 1.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	8	51.0 ± 0.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	13	59.3 ± 1.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	2	91.4 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	4	57.8 ± 7.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	12	54.5 ± 0.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	3	59.2 ± 0.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	48	22.6 ± 24.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	20	57.0 ± 1.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	110	36.1 ± 0.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	36	30.0 ± 0.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B,SUN,SUM	1	55.7 ± 0.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	6	68.5 ± 1.0	NB
A	*Branta bernicla*	Brant				S1N,S2S3M	81	30.7 ± 10.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	2	65.7 ± 0.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	284	11.1 ± 1.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	14	47.6 ± 7.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	5	25.4 ± 0.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	6	49.4 ± 0.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1S2B,S4N,S5M	34	50.7 ± 0.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	7	57.3 ± 0.0	NB
A	*Microtus chrotorrhinus*	Rock Vole				S2?	30	76.2 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	62	21.8 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	33	29.2 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	58	34.8 ± 7.0	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	55	49.1 ± 0.0	NB
A	*Alca torda*	Razorbill				S2B,S3N,S3M	19	58.2 ± 14.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	87	0.3 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	85	12.8 ± 0.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S2B,SUM	1	90.5 ± 0.0	NB
A	*Anser caerulescens*	Snow Goose				S2M	9	49.1 ± 0.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	7	26.2 ± 0.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	2	67.6 ± 1.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	17	24.3 ± 5.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	17	39.2 ± 1.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	69	6.5 ± 7.0	NB
A	*Spatula clypeata*	Northern Shoveler				S2S3B,S2S3M	81	48.0 ± 0.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	25	29.2 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	266	4.4 ± 7.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	53	29.5 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	8	50.8 ± 0.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	72	42.7 ± 0.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	89	27.1 ± 0.0	NB
A	*Spinus pinus*	Pine Siskin				S3	294	4.4 ± 7.0	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	2	86.2 ± 0.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	5	80.8 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	38	69.4 ± 0.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	18	50.0 ± 0.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	14	34.8 ± 7.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	724	5.8 ± 7.0	NB
A	*Tringa semipalmata*	Willet				S3B,S3M	409	24.2 ± 0.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	62	21.8 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	60	21.8 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	67	26.3 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	19	38.0 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	135	4.4 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	74	21.8 ± 7.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	185	25.4 ± 0.0	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	230	10.4 ± 0.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	192	27.6 ± 1.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	268	7.7 ± 0.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	673	28.2 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	5	57.4 ± 0.0	NB
A	*Melanitta americana*	Black Scoter				S3M,S1S2N	154	24.3 ± 5.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	33	24.3 ± 5.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	20	29.5 ± 0.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	11	69.4 ± 0.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	229	4.4 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	1130	4.4 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	334	5.8 ± 7.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	444	24.3 ± 5.0	NB
A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	765	15.2 ± 7.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	512	28.1 ± 1.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	817	24.2 ± 0.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	76	49.2 ± 0.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	476	24.2 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	208	24.3 ± 5.0	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1	9	91.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Coenonympha nipisiquit*	Maritime Ringlet	Endangered	Endangered	Endangered	S1	103	26.0 ± 5.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	22	47.6 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	29	73.5 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Special Concern	S2	17	66.1 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern	Special Concern		S3?	35	15.0 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	9	24.9 ± 1.0	NB
I	*Erora laeta*	Early Hairstreak				S1	1	90.4 ± 7.0	NB
I	*Catocala neogama*	The Bride				S1	1	63.4 ± 1.0	NB
I	*Somatochlora septentrionalis*	Muskeg Emerald				S1	4	84.0 ± 0.0	NB
I	*Leucorrhinia patricia*	Canada Whiteface				S1	11	52.1 ± 1.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	25	24.4 ± 2.0	NB
I	*Cicindela ancocisconensis*	Appalachian Tiger Beetle				S2	1	96.0 ± 0.0	NB
I	*Satyrium calanus*	Banded Hairstreak				S2	1	90.1 ± 7.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	11	14.2 ± 1.0	NB
I	*Aeshna juncea*	Rush Darner				S2	13	62.9 ± 1.0	NB
I	*Somatochlora brevicincta*	Quebec Emerald				S2	8	90.7 ± 0.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5	24.6 ± 0.0	NB
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	14	12.6 ± 1.0	NB
I	*Chrysops delicatulus*	a Horse Fly				S2S3	1	76.1 ± 1.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	15	27.2 ± 7.0	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3	2	28.1 ± 5.0	NB
I	*Carabus maeander*	a Ground Beetle				S3	1	89.9 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	2	91.9 ± 1.0	NB
I	*Xylotrechus quadrimaculatus*	a Longhorned Beetle				S3	1	67.6 ± 1.0	NB
I	*Xylotrechus undulatus*	a Longhorned Beetle				S3	2	68.6 ± 1.0	NB
I	*Calathus gregarius*	a Ground Beetle				S3	1	34.7 ± 1.0	NB
I	*Hyperaspis disconotata*	a Ladybird Beetle				S3	1	49.9 ± 5.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	10	47.5 ± 0.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	11	17.9 ± 0.0	NB
I	*Papilio brevicauda*	Short-tailed Swallowtail				S3	1	66.3 ± 0.0	NB
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	104	26.3 ± 7.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	9	50.0 ± 0.0	NB
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	147	26.0 ± 6.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	8	26.3 ± 7.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	38	9.8 ± 0.0	NB
I	*Callophrys eryphon*	Western Pine Elfin				S3	25	27.2 ± 7.0	NB
I	*Plebejus idas*	Northern Blue				S3	4	81.5 ± 0.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	41	56.4 ± 7.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	2	24.4 ± 1.0	NB
I	*Boloria eunomia*	Bog Fritillary				S3	17	20.5 ± 0.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	12	30.3 ± 2.0	NB
I	*Boloria chariclea*	Arctic Fritillary				S3	42	24.4 ± 2.0	NB
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S3	2	21.3 ± 10.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	17	25.2 ± 0.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	49	20.8 ± 0.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	10	46.7 ± 10.0	NB
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	5	48.8 ± 0.0	NB
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3	91.1 ± 0.0	NB
I	*Somatochlora albicincta*	Ringed Emerald				S3	32	46.4 ± 1.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	26	22.3 ± 1.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	13	7.7 ± 1.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	3	72.2 ± 0.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	14	22.3 ± 1.0	NB
I	*Stylurus scudderi*	Zebra Clubtail				S3	1	65.2 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	1	89.7 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip				S3	1	90.5 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Pantala hymenaea*	Spot-Winged Glider				S3B,S3M	2	92.5 ± 0.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	23	23.6 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	1	87.8 ± 15.0	NB
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	8	38.1 ± 0.0	NB
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	7	50.0 ± 13.0	NB
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2	144	25.3 ± 0.0	NB
N	*Arctoa fulvella*	a Moss				S1	2	82.3 ± 1.0	NB
N	*Aulacomnium heterostichum*	One-sided Groove Moss				S1	1	88.4 ± 0.0	NB
N	*Campylostelium saxicola*	a Moss				S1	1	86.5 ± 0.0	NB
N	*Grimmia donniana*	Donn's Grimmia Moss				S1	4	81.8 ± 0.0	NB
N	*Grimmia incurva*	Black Grimmia				S1	4	81.8 ± 0.0	NB
N	*Kiaeria starkei*	Starke's Fork Moss				S1	1	82.3 ± 1.0	NB
N	*Pseudoleskeella tectorum*	Rooftop Leskea Moss				S1	2	69.4 ± 0.0	NB
N	*Syntrichia ruralis*	a Moss				S1	1	45.9 ± 0.0	NB
N	*Zygodon viridissimus var. viridissimus*	a Moss				S1	1	86.6 ± 0.0	NB
N	*Collema tenax*	Soil Tarpaper Lichen				S1	2	69.5 ± 0.0	NB
N	*Sticta fuliginosa*	Peppered Moon Lichen				S1	1	61.8 ± 13.0	NB
N	*Leptogium hirsutum*	Jellyskin Lichen				S1	1	46.3 ± 0.0	NB
N	*Lathagrium auriforme*	a tarpaper lichen				S1	1	45.8 ± 0.0	NB
N	*Ephebe hispidula*	Dryside Rockshag Lichen				S1	1	69.1 ± 0.0	NB
N	*Ephebe perspinulosa*	Thread Lichen				S1	2	68.5 ± 0.0	NB
N	*Leptogium intermedium*	Forty-five Jellyskin Lichen				S1	8	68.6 ± 0.0	NB
N	*Leptogium schraderi*	Schrader's Jellyskin Lichen				S1	1	69.4 ± 0.0	NB
N	*Phaeophyscia decolor*	Lesser Eye Shadow Lichen				S1	2	63.6 ± 0.0	NB
N	*Phaeophyscia hispidula*	Whiskered Shadow Lichen				S1	1	46.2 ± 0.0	NB
N	*Cetraria ericetorum ssp. ericetorum*	a Lichen				S1	2	81.1 ± 20.0	NB
N	*Anastrophyllum saxicola*	Curled Notchwort				S1?	1	93.7 ± 0.0	NB
N	*Bryum blindii*	a Moss				S1?	1	59.0 ± 1.0	NB
N	*Cinclidium stygium*	Sooty Cupola Moss				S1?	1	42.2 ± 0.0	NB
N	*Tortula cernua*	Narrow-Leafed Chain-Teeth Moss				S1?	2	59.0 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2	83.3 ± 1.0	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	1	86.8 ± 0.0	NB
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	1	42.2 ± 0.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	1	87.0 ± 13.0	NB
N	*Seligeria recurvata*	a Moss				S1?	5	68.6 ± 0.0	NB
N	*Rhizomnium pseudopunctatum*	Felted Leafy Moss				S1?	2	86.1 ± 1.0	NB
N	*Thermutis velutina*	Rockvelvet Lichen				S1?	1	69.5 ± 0.0	NB
N	*Ephebe solida*	a Rockshag Lichen				S1?	1	63.6 ± 0.0	NB
N	*Peltigera venosa*	Fan Pelt Lichen				S1?	4	56.6 ± 0.0	NB
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S1?	2	53.1 ± 0.0	NB
N	*Lophozia heterocolpos*	Whip Notchwort				S1S2	2	79.6 ± 0.0	NB
N	*Metacalypogeia schusterana*	Schuster's Pouchwort				S1S2	1	83.5 ± 0.0	NB
N	*Odontoschisma sphagni*	Bog-Moss Flapwort				S1S2	1	84.7 ± 0.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	1	88.6 ± 1.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	2	45.5 ± 0.0	NB
N	*Calliergon richardsonii*	Richardson's Spear Moss				S1S2	1	86.1 ± 1.0	NB
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S1S2	2	63.4 ± 0.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	2	59.0 ± 1.0	NB
N	*Drummondia prorepens*	a Moss				S1S2	1	86.8 ± 0.0	NB
N	*Hygrohypnum bestii*	Best's Brook Moss				S1S2	1	63.6 ± 0.0	NB
N	*Platydictya confervoides*	a Moss				S1S2	1	68.6 ± 0.0	NB
N	*Seligeria brevifolia*	a Moss				S1S2	8	69.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Timmia norvegica var. excurrens*	a moss				S1S2	2	79.6 ± 0.0	NB
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S1S2	2	38.0 ± 0.0	NB
N	*Leptogium gelatinosum*	Rose-petalled Jellyskin Lichen				S1S2	3	69.4 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	1	60.3 ± 1.0	NB
N	*Lophozia badensis*	Dwarf Notchwort				S1S3	1	59.0 ± 1.0	NB
N	*Lophozia obtusa*	Obtuse Notchwort				S1S3	2	89.0 ± 0.0	NB
N	*Anomodon viticulosus*	a Moss				S2	3	97.1 ± 0.0	NB
N	*Didymodon ferrugineus*	a moss				S2	1	76.0 ± 0.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	1	86.3 ± 0.0	NB
N	*Isopterygiopsis pulchella*	Neat Silk Moss				S2	1	69.4 ± 0.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	1	47.8 ± 10.0	NB
N	*Platydictya jungermannioides*	False Willow Moss				S2	1	95.2 ± 1.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	4	86.3 ± 0.0	NB
N	*Pohlia sphagnicola*	a moss				S2	2	76.0 ± 1.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	1	20.7 ± 0.0	NB
N	*Sphagnum flexuosum*	Flexuous Peatmoss				S2	2	88.6 ± 0.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	1	85.4 ± 0.0	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	5	86.3 ± 0.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	3	59.0 ± 1.0	NB
N	*Anomobryum filiforme*	a moss				S2	1	59.0 ± 1.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	5	63.6 ± 0.0	NB
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S2	18	47.2 ± 0.0	NB
N	*Barbilophozia lycopodioides*	Greater Pawwort				S2?	2	66.1 ± 1.0	NB
N	*Anacamptodon splachnoides*	a Moss				S2?	2	87.0 ± 13.0	NB
N	*Bryum pallescens*	Pale Bryum Moss				S2?	1	95.4 ± 100.0	NB
N	*Hygrohypnum montanum*	a Moss				S2?	2	83.6 ± 0.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	2	89.5 ± 0.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	1	85.9 ± 0.0	NB
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S2?	2	83.8 ± 0.0	NB
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	1	91.0 ± 0.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	1	88.1 ± 0.0	NB
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	6	56.6 ± 0.0	NB
N	*Bryum uliginosum*	a Moss				S2S3	4	57.8 ± 9.0	NB
N	*Campylium polygamum*	a Moss				S2S3	2	85.7 ± 0.0	NB
N	*Hypnum cupressiforme var. filiforme*	a Moss				S2S3	2	63.4 ± 0.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2S3	9	50.8 ± 0.0	NB
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	8	86.3 ± 0.0	NB
N	*Saelania glaucescens*	Blue Dew Moss				S2S3	12	45.5 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	3	32.1 ± 1.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	3	85.7 ± 0.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	1	86.8 ± 0.0	NB
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2S3	3	69.4 ± 0.0	NB
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3	1	51.6 ± 0.0	NB
N	*Dendriscocaulon umhausense*	a lichen				S2S3	1	86.2 ± 0.0	NB
N	*Tortella fragilis*	Fragile Twisted Moss				S3	1	97.9 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	1	91.2 ± 0.0	NB
N	*Hymenostylium recurvirostre*	Hymenostylium Moss				S3	5	69.4 ± 0.0	NB
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	5	69.1 ± 0.0	NB
N	*Solorina saccata*	Woodland Owl Lichen				S3	68	46.0 ± 0.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	2	91.1 ± 0.0	NB
N	*Cladonia strepsilis*	Olive Cladonia Lichen				S3	1	99.8 ± 0.0	NB
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	12	45.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Nephroma resupinatum*	a lichen				S3	5	48.9 ± 0.0	NB
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	5	51.6 ± 0.0	NB
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	1	51.0 ± 0.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	4	88.4 ± 0.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	1	62.3 ± 7.0	NB
N	*Leptogium subtile*	Appressed Jellyskin Lichen				S3?	3	25.3 ± 0.0	NB
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	1	81.5 ± 8.0	NB
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	1	69.5 ± 0.0	NB
N	*Dicranella varia*	a Moss				S3S4	2	57.8 ± 9.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	4	88.6 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	80.1 ± 10.0	NB
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	5	47.7 ± 0.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	5	57.8 ± 9.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	4	58.7 ± 1.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	2	45.5 ± 0.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	9	47.7 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	2	81.9 ± 0.0	NB
N	*Sphagnum compactum*	Compact Peat Moss				S3S4	1	86.6 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	2	94.6 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	1	88.4 ± 0.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	5	46.1 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	1	75.7 ± 0.0	NB
N	*Rauiella scita*	Smaller Fern Moss				S3S4	1	91.0 ± 0.0	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	5	42.4 ± 0.0	NB
N	*Pseudocyphellaria holarctica*	Yellow Specklebelly Lichen				S3S4	5	88.1 ± 0.0	NB
N	*Leptogium teretiusculum*	Beaded Jellyskin Lichen				S3S4	2	69.2 ± 0.0	NB
N	*Cladonia terrae-novae*	Newfoundland Reindeer Lichen				S3S4	1	63.9 ± 0.0	NB
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	2	49.6 ± 0.0	NB
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	25	45.5 ± 0.0	NB
N	*Montanelia panniformis*	Shingled Camouflage Lichen				S3S4	1	51.0 ± 0.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	12	45.6 ± 0.0	NB
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	28	45.5 ± 0.0	NB
N	*Fuscopannaria sorediata*	a Lichen				S3S4	1	42.4 ± 0.0	NB
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	1	23.8 ± 1.0	NB
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	10	59.9 ± 0.0	NB
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3S4	43	47.7 ± 0.0	NB
N	*Hennediella heimii*	Long-Stalked Beardless Moss				SH	1	93.2 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	9	86.1 ± 0.0	NB
N	*Splachnum luteum*	Yellow Collar Moss				SH	1	95.4 ± 100.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	25	85.4 ± 0.0	NB
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	51	68.5 ± 0.0	NB
P	*Fraxinus nigra*	Black Ash	Threatened			S4S5	421	2.8 ± 0.0	NB
P	*Lechea maritima var. subcylindrica*	Beach Pinweed	Special Concern	Special Concern	Special Concern	S2	176	62.2 ± 0.0	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Special Concern	Special Concern	Endangered	S2S3	13	97.7 ± 0.0	NB
P	*Symphyotrichum subulatum (Bathurst pop)*	Bathurst Aster - Bathurst pop.	Not At Risk		Endangered	S2	246	23.5 ± 0.0	NB
P	*Eriocaulon parkeri*	Parker's Pipewort	Not At Risk		Endangered	S2	156	48.6 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	14	48.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Cryptotaenia canadensis*	Canada Honewort				S1	1	92.1 ± 1.0	NB
P	*Arnica lonchophylla*	Northern Arnica				S1	11	68.1 ± 0.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	1	58.1 ± 0.0	NB
P	*Bidens eatonii*	Eaton's Beggarticks				S1	9	48.2 ± 0.0	NB
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	1	63.4 ± 0.0	NB
P	*Canadanthus modestus*	Great Northern Aster				S1	1	94.6 ± 0.0	NB
P	*Betula glandulosa*	Glandular Birch				S1	28	41.2 ± 0.0	NB
P	*Betula michauxii*	Michaux's Dwarf Birch				S1	3	80.3 ± 0.0	NB
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	4	21.4 ± 0.0	NB
P	*Hackelia deflexa ssp. americana*	American Stickseed				S1	3	80.5 ± 10.0	NB
P	*Cardamine parviflora*	Small-flowered Bittercress				S1	1	6.0 ± 0.0	NB
P	*Descurainia incana*	Gray Tansy Mustard				S1	4	96.5 ± 0.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	2	69.5 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	7	55.7 ± 0.0	NB
P	*Draba incana*	Twisted Whitlow-grass				S1	2	67.3 ± 0.0	NB
P	*Boechera grahamii*	Graham's Rockcress				S1	12	81.1 ± 5.0	NB
P	*Moehringia macrophylla*	Large-Leaved Sandwort				S1	8	46.2 ± 0.0	NB
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2	61.0 ± 10.0	NB
P	*Stellaria longipes*	Long-stalked Starwort				S1	10	55.8 ± 0.0	NB
P	*Blitum capitatum*	strawberry-blite				S1	1	82.4 ± 1.0	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	1	64.8 ± 0.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	18	41.1 ± 0.0	NB
P	*Vaccinium uliginosum*	Alpine Bilberry				S1	6	41.1 ± 0.0	NB
P	*Euphorbia polygonifolia*	Seaside Spurge				S1	5	70.4 ± 5.0	NB
P	*Bartonia virginica*	Yellow Bartonia				S1	3	84.0 ± 0.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	1	97.4 ± 0.0	NB
P	*Bistorta vivipara*	Alpine Bistort				S1	1	87.4 ± 0.0	NB
P	*Coptidium lapponicum*	Lapland Buttercup				S1	1	46.0 ± 0.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	12	59.3 ± 0.0	NB
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S1	1	81.5 ± 0.0	NB
P	*Salix serissima*	Autumn Willow				S1	4	41.5 ± 0.0	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	4	46.9 ± 0.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1	12	57.3 ± 0.0	NB
P	*Limosella aquatica*	Water Mudwort				S1	18	96.3 ± 0.0	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	2	85.5 ± 0.0	NB
P	*Carex glareosa*	Gravel Sedge				S1	6	78.6 ± 1.0	NB
P	*Carex media*	Intermediate Sedge				S1	1	96.3 ± 0.0	NB
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	1	97.1 ± 0.0	NB
P	*Carex viridula var. elatior*	Greenish Sedge				S1	14	41.4 ± 0.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	6	82.2 ± 0.0	NB
P	*Carex bigelowii*	Bigelow's Sedge				S1	7	53.1 ± 0.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	6	50.1 ± 0.0	NB
P	*Cyperus bipartitus*	Shining Flatsedge				S1	23	44.9 ± 0.0	NB
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S1	8	56.5 ± 0.0	NB
P	*Schoenoplectiella smithii*	Smith's Bulrush				S1	10	56.5 ± 0.0	NB
P	*Schoenoplectiella smithii var. leviseta*	Smith's Bulrush				S1	17	56.8 ± 0.0	NB
P	*Schoenoplectiella smithii var. leviseta*	Smith's Bulrush				S1	33	48.6 ± 0.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	1	57.3 ± 0.0	NB
P	*Juncus greenei*	Greene's Rush				S1	1	51.4 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Juncus stygius ssp. americanus*	Moor Rush				S1	1	84.1 ± 0.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	8	61.3 ± 0.0	NB
P	*Oreojuncus trifidus*	Highland Rush				S1	9	53.1 ± 0.0	NB
P	*Allium canadense*	Canada Garlic				S1	1	63.5 ± 1.0	NB
P	*Anticlea elegans*	Mountain Death Camas				S1	10	55.7 ± 0.0	NB
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	2	41.8 ± 0.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	2	54.3 ± 0.0	NB
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	1	92.7 ± 0.0	NB
P	*Catabrosa aquatica*	Water Whorl Grass				S1	2	83.4 ± 5.0	NB
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	7	14.6 ± 0.0	NB
P	*Elymus hystrix*	Spreading Wild Rye				S1	2	95.0 ± 0.0	NB
P	*Zizania aquatica var. brevis*	St. Lawrence Wild Rice				S1	26	44.9 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	8	83.2 ± 0.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	5	56.9 ± 0.0	NB
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	1	23.8 ± 0.0	NB
P	*Gymnocarpium continentale*	Nahanni Oak Fern				S1	1	98.5 ± 1.0	NB
P	*Gymnocarpium robertianum*	Limestone Oak Fern				S1	1	82.9 ± 0.0	NB
P	*Polystichum lonchitis*	Northern Holly Fern				S1	4	68.1 ± 0.0	NB
P	*Huperzia selago*	Northern Firmoss				S1	3	53.2 ± 0.0	NB
P	*Bidens heterodoxa*	Connecticut Beggar-Ticks				S1?	3	87.7 ± 1.0	NB
P	*Cuscuta campestris*	Field Dodder				S1?	3	63.9 ± 0.0	NB
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	4	56.4 ± 1.0	NB
P	*Galium trifidum ssp. subbiflorum*	Three-petaled Bedstraw				S1?	2	74.6 ± 0.0	NB
P	*Carex laxiflora*	Loose-Flowered Sedge				S1?	1	54.8 ± 2.0	NB
P	*Poa interior*	Inland Bluegrass				S1?	1	71.3 ± 0.0	NB
P	*Carex crawei*	Crawe's Sedge				S1S2	1	56.7 ± 0.0	NB
P	*Coryphopteris simulata*	Bog Fern				S1S2	1	61.0 ± 1.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	33	23.5 ± 0.0	NB
P	*Spiranthes arcisepala*	Appalachian Ladies'-tresses				S1S3	1	78.9 ± 0.0	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	29	77.7 ± 0.0	NB
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S2	6	25.4 ± 0.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	2	61.1 ± 0.0	NB
P	*Solidago racemosa*	Racemose Goldenrod				S2	2	68.1 ± 0.0	NB
P	*Ionactis linariifolia*	Flax-leaved Aster				S2	59	2.6 ± 0.0	NB
P	*Symphyotrichum subulatum*	Annual Saltmarsh Aster				S2	152	32.3 ± 0.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3	57.4 ± 0.0	NB
P	*Betula minor*	Dwarf White Birch				S2	22	52.8 ± 0.0	NB
P	*Boechera stricta*	Drummond's Rockcress				S2	5	0.2 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	5	31.5 ± 1.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S2	1	2.9 ± 0.0	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	6	68.7 ± 5.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S2	11	62.0 ± 0.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	1	82.0 ± 1.0	NB
P	*Shepherdia canadensis*	Soapberry				S2	2	71.4 ± 1.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	2	63.4 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3	9.2 ± 10.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	19	55.7 ± 0.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S2	1	61.3 ± 1.0	NB
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	4	47.3 ± 0.0	NB
P	*Aphyllon uniflorum*	One-flowered Broomrape				S2	2	65.2 ± 10.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S2	1	63.4 ± 0.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S2	9	63.5 ± 1.0	NB
P	*Anemone multifida*	Cut-leaved Anemone				S2	1	86.2 ± 10.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2	4	51.6 ± 0.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	2	14.5 ± 1.0	NB
P	*Rosa acicularis ssp. sayi*	Prickly Rose				S2	103	1.1 ± 0.0	NB
P	*Galium kamtschaticum*	Northern Wild Licorice				S2	9	71.3 ± 5.0	NB
P	*Salix candida*	Sage Willow				S2	23	28.3 ± 0.0	NB
P	*Castilleja septentrionalis*	Northeastern Paintbrush				S2	4	79.1 ± 1.0	NB
P	*Viola novae-angliae*	New England Violet				S2	7	69.4 ± 0.0	NB
P	*Sagittaria montevidensis ssp. spongiosa*	Spongy Arrowhead				S2	117	44.7 ± 0.0	NB
P	*Carex concinna*	Beautiful Sedge				S2	24	91.7 ± 0.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S2	17	71.8 ± 5.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	14	41.4 ± 0.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S2	12	50.0 ± 0.0	NB
P	*Carex prairea*	Prairie Sedge				S2	1	74.1 ± 1.0	NB
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2	5	27.0 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S2	12	27.3 ± 5.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	1	8.2 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	3	71.8 ± 10.0	NB
P	*Carex albicans*	White-tinged Sedge				S2	1	71.8 ± 0.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	9	62.1 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	4	68.6 ± 0.0	NB
P	*Blysmopsis rufa*	Red Bulrush				S2	60	26.6 ± 1.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S2	2	90.0 ± 0.0	NB
P	*Juncus vaseyi*	Vasey Rush				S2	30	5.0 ± 0.0	NB
P	*Allium tricoccum*	Wild Leek				S2	3	53.4 ± 0.0	NB
P	*Galearis rotundifolia*	Small Round-leaved Orchid				S2	13	41.6 ± 0.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	8	48.9 ± 0.0	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	6	44.8 ± 1.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	4	46.3 ± 5.0	NB
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S2	35	25.2 ± 1.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	5	63.8 ± 1.0	NB
P	*Agrostis mertensii*	Northern Bent Grass				S2	115	3.9 ± 0.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3	1.4 ± 0.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	5	14.3 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	6	23.7 ± 0.0	NB
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	7	28.2 ± 1.0	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S2	6	48.8 ± 10.0	NB
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	10	14.2 ± 1.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	12	45.7 ± 0.0	NB
P	*Anchistea virginica*	Virginia chain fern				S2	9	79.0 ± 1.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S2	21	51.9 ± 0.0	NB
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S2	2	52.9 ± 0.0	NB
P	*Botrychium minganense*	Mingan Moonwort				S2	6	81.5 ± 0.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	16	41.6 ± 0.0	NB
P	*Toxicodendron radicans var. radicans*	Eastern Poison Ivy				S2?	2	85.7 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	1	97.8 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	3	50.1 ± 0.0	NB
P	*Crataegus macrosperma*	Big-Fruit Hawthorn				S2?	1	14.5 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	9	42.6 ± 1.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	7	34.4 ± 5.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	4	46.9 ± 10.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	3	11.5 ± 0.0	NB
P	*Solidago altissima*	Tall Goldenrod				S2S3	4	73.5 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	13	51.7 ± 0.0	NB
P	*Elatine americana*	American Waterwort				S2S3	26	45.3 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	2	83.6 ± 0.0	NB
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	3	83.5 ± 0.0	NB
P	*Rumex persicarioides*	Peach-leaved Dock				S2S3	3	62.2 ± 0.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	7	23.3 ± 17.0	NB
P	*Rumex occidentalis*	Western Dock				S2S3	25	21.8 ± 0.0	NB
P	*Amelanchier gaspensis*	Gasp├⌐ Serviceberry				S2S3	2	90.4 ± 0.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	1	59.3 ± 2.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	18	20.5 ± 0.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S2S3	10	41.6 ± 0.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	1.6 ± 0.0	NB
P	*Scirpus atrovirens*	Dark-green Bulrush				S2S3	24	83.9 ± 0.0	NB
P	*Juncus brachycephalus*	Small-Head Rush				S2S3	3	41.6 ± 0.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	5	45.2 ± 1.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	5	49.7 ± 18.0	NB
P	*Neottia auriculata*	Auricled Twayblade				S2S3	23	20.2 ± 0.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2S3	1	86.5 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	12	72.3 ± 1.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	5	63.2 ± 0.0	NB
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S2S3	1	71.8 ± 0.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	9	19.4 ± 0.0	NB
P	*Arnica lanceolata*	Lance-leaved Arnica				S3	48	5.8 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	6	55.8 ± 0.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3	200	32.1 ± 0.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	254	23.8 ± 0.0	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	2	97.5 ± 0.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	5	15.9 ± 5.0	NB
P	*Betula pumila*	Bog Birch				S3	112	41.6 ± 0.0	NB
P	*Turritis glabra*	Tower Mustard				S3	11	1.4 ± 0.0	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	18	45.7 ± 0.0	NB
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3	1	69.3 ± 1.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	13	26.5 ± 0.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	1	49.0 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	114	30.8 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	82	45.0 ± 0.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3	5	96.2 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	5	45.7 ± 1.0	NB
P	*Astragalus alpinus var. brunetianus*	Alpine Milk-Vetch				S3	3	98.7 ± 1.0	NB
P	*Hedysarum americanum*	Alpine Hedysarum				S3	8	7.8 ± 0.0	NB
P	*Gentianella amarella*	Northern Gentian				S3	1	53.4 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	6	69.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	7	36.9 ± 0.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	6	40.3 ± 0.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	5	45.7 ± 1.0	NB
P	*Teucrium canadense*	Canada Germander				S3	43	49.4 ± 5.0	NB
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3	10	40.1 ± 1.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	32	4.8 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	3	48.4 ± 0.0	NB
P	*Polygala sanguinea*	Blood Milkwort				S3	21	81.5 ± 0.0	NB
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	25	75.6 ± 5.0	NB
P	*Persicaria punctata*	Dotted Smartweed				S3	72	44.6 ± 0.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3	48	49.9 ± 0.0	NB
P	*Littorella americana*	American Shoreweed				S3	1	54.2 ± 1.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	7	62.3 ± 10.0	NB
P	*Samolus parviflorus*	Seaside Brookweed				S3	129	44.5 ± 0.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	23	29.3 ± 0.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	17	21.3 ± 1.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	14	42.0 ± 1.0	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3	5	60.4 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4	51.4 ± 7.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4	51.5 ± 1.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	1	54.3 ± 0.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3	47	26.5 ± 5.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	6	61.5 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	26	64.7 ± 0.0	NB
P	*Salix interior*	Sandbar Willow				S3	2	56.9 ± 0.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	58	28.8 ± 1.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3	43	41.6 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3	155	23.6 ± 0.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	7	48.2 ± 0.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	16	48.8 ± 0.0	NB
P	*Viola adunca*	Hooked Violet				S3	9	51.3 ± 0.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	51	41.6 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	8	70.6 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	169	41.6 ± 0.0	NB
P	*Carex chordorrhiza*	Creeping Sedge				S3	1	79.5 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	1	31.7 ± 10.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3	95	45.5 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	31	2.9 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	7	23.9 ± 0.0	NB
P	*Carex michauxiana*	Michaux's Sedge				S3	6	55.0 ± 0.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	12	21.3 ± 1.0	NB
P	*Carex rosea*	Rosy Sedge				S3	1	74.0 ± 5.0	NB
P	*Carex tenera*	Tender Sedge				S3	2	51.6 ± 0.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	16	7.7 ± 0.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	15	41.6 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	35	13.2 ± 2.0	NB
P	*Carex recta*	Estuary Sedge				S3	15	28.2 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	116	17.6 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	1	23.2 ± 10.0	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	2	64.7 ± 0.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	35	44.7 ± 0.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	66	5.2 ± 0.0	NB
P	*Rhynchospora fusca*	Brown Beakrush				S3	5	57.9 ± 1.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	85	2.9 ± 0.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	7	49.0 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S3	1	70.1 ± 2.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3	8	52.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	20	41.1 ± 1.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	7	48.4 ± 3.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	147	20.5 ± 0.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	17	19.2 ± 0.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	7	20.9 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	27	1.4 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	16	23.9 ± 1.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	7	53.8 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	80	62.9 ± 0.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	71	23.2 ± 1.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	2	61.1 ± 0.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	81	17.5 ± 0.0	NB
P	*Asplenium viride*	Green Spleenwort				S3	192	23.7 ± 0.0	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	97	38.0 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	38	46.4 ± 0.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3	6	51.4 ± 0.0	NB
P	*Isoetes tuckermanii ssp. tuckermanii*	Tuckerman's Quillwort				S3	5	57.5 ± 0.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	13	41.0 ± 0.0	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	21	36.9 ± 1.0	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	7	43.3 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	11	46.6 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3	1	82.9 ± 1.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	1	52.4 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	9	55.4 ± 2.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	49	19.4 ± 0.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	38	30.0 ± 1.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	21	47.6 ± 0.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	22	2.0 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	1	77.8 ± 1.0	NB
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	49	62.4 ± 0.0	NB
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	7	1.6 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	161	50.1 ± 0.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	63	21.0 ± 0.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	2	24.3 ± 1.0	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	2	57.1 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	68	49.8 ± 0.0	NB
P	*Triglochin gaspensis*	Gasp├⌐ Arrowgrass				S3S4	80	26.2 ± 1.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	17	48.4 ± 0.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	18	51.7 ± 0.0	NB
P	*Distichlis spicata*	Salt Grass				S3S4	44	32.3 ± 0.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	8	23.9 ± 0.0	NB
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				SH	6	27.3 ± 10.0	NB
P	*Montia fontana*	Water Blinks				SH	2	51.0 ± 1.0	NB
P	*Aquilegia canadensis*	Red Columbine				SH	1	85.7 ± 10.0	NB
P	*Botrychium campestre*	Prairie Moonwort				SH	1	55.9 ± 0.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

# recs	CITATION
4876	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
4182	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
2522	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
2209	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2107	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
1063	Pardieck, K.L. & Ziolkowski Jr., D.J.; Hudson, M.-A.R. 2014. North American Breeding Bird Survey Dataset 1966 - 2013, version 2013.0. U.S. Geological Survey, Patuxent Wildlife Research Center <www.pwrc.usgs.gov/BBS/RawData/>.
672	Kouwenberg, Amy-Lee. 2019. Mountain Birdwatch database 2012-2018. Bird Studies Canada, Sackville, NB, 6484 recs.
590	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
588	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
532	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
531	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
513	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. https://doi.org/10.1037/arc0000014.
455	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
445	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
432	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
428	Beaudet, A. 2007. Piping Plover Records in Kouchibouguac NP, 1982-2005. Kouchibouguac National Park, 435 recs.
372	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
358	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
352	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
343	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
306	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
295	Gravel, Mireille. 2010. Coordonnées GPS et suivi des tortues marquées, 2005-07. Kouchibouguac National Park, 480 recs.
290	Campbell, G. 2017. Maritimes Bicknell's Thrush database 2002-2015. Bird Studies Canada, Sackville NB, 609 recs.
280	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
268	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
254	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
242	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
213	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
209	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
207	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
187	Sabine, M. 2016. Black Ash records from the NB DNR Forest Development Survey. New Brunswick Department of Natural Resources.
186	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
186	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
155	Blaney, C.S. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre.
155	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
150	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
148	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
143	Askanas, H. 2016. New Brunswick Wood Turtle Database. New Brunswick Department of Energy and Resource Development.
142	Klymko, J. 2020. Atlantic Canada Conservation Data Centre zoological fieldwork 2019. Atlantic Canada Conservation Data Centre.
138	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
137	Mazerolle, D.M. 2020. Atlantic Canada Conservation Data Centre botanical fieldwork 2019. Atlantic Canada Conservation Data Centre.
132	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
131	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
129	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
123	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
120	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
119	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.
119	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
114	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
113	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
107	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
104	Berrigan, L. 2019. Maritimes Marsh Monitoring Project 2013, 2014, 2016, 2017, and 2018 data. Bird Studies Canada, Sackville, NB.
104	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.

# recs	CITATION
104	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
102	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
88	Tremblay, E. 2006. Kouchibouguac National Park Digital Database. Parks Canada, 105 recs.
72	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
72	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.
70	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
70	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
68	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
66	Coursol, F. 2005. Dataset from New Brunswick fieldwork for Eriocaulon parkeri COSEWIC report. Coursol, Pers. comm. to C.S. Blaney, Aug 26. 110 recs.
64	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
63	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
63	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
62	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
61	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
60	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre, 1015 recs.
55	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
46	Anon. 2017. Export of Maritimes Butterfly records. Global Biodiversity Information Facility (GBIF).
46	Hilaire Chiasson Rare vascular plant specimens in the Hilaire Chiasson Herabarium. 2015.
44	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
44	Churchill, J.L.; Walker, J. 2017. Species at Risk Surveys at Correctional Services Canada Properties in Nova Scotia and New Brunswick. Atlantic Canada Conservation Data Centre.
40	Amirault, D.L. 2000. Piping Plover Surveys, 1983-2000. Canadian Wildlife Service, Sackville, unpublished data. 70 recs.
40	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
37	Allen, K. 2012. Rare plant spatial data from Pleasant Ridge cranberry farm. NB Deparment of Environment, Environmental Assessment Section, 39 recs.
36	Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor couguar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
35	Miramichi River Environmental Assessment Committee. 2017. Wood Turtle (Glyptemys insculpta) Miramichi & Richibucto Watersheds Inventory 2016. Vladimir King Trajkovic (ed.) Miramichi River Environmental Assessment Committee.
35	Tranquilla, L. 2015. Maritimes Marsh Monitoring Project 2015 data. Bird Studies Canada, Sackville NB, 5062 recs.
34	Sabine, D.L. & Bishop, G. 2004. Vascular Plant Survey of Tidehead Boomground Marsh. New Brunswick Fisheries & Wildlife, 18pp.
31	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
31	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
31	Mazerolle, D.M. 2005. Bouctouche Irving Eco-Centre rare coastal plant fieldwork results 2004-05. Irving Eco-centre, la Dune du Bouctouche, 174 recs.
30	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
30	Campbell, G., Villamil, L. 2012. Heath Steele Mine Bird Surveys 2012.
29	Robinson, S.L. 2015. 2014 field data.
29	Wood Turtle (Glyptemys insculpta) Miramichi Watershed Synopsis 2013 Compiled by: Vladimir King Trajkovic, EPt Miramichi River Environmental Assessment Committee
28	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
28	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
27	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
26	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
23	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
23	Keppie, D.M. 2005. Rare Small Mammal Records in NB, PE. Pers. comm. to K. Bredin; PE 1 rec., NB 24 recs, 23 recs.
22	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
22	Trajkovic, V.K. 2017. Wood turtles inventroy miramichi watershed 2017. Miramichi River Environmental Action Committee, 22 records.
21	Klymko, J.J.D. 2016. 2014 field data. Atlantic Canada Conservation Data Centre.
21	McAlpine, D.F. 1998. NBM Science Collections: Wood Turtle records. New Brunswick Museum, Saint John NB, 329 recs.
21	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
20	Doucet, D.A. & Edsall, J. 2007. Ophiogomphus howei records. Atlantic Canada Conservation Data Centre, Sackville NB, 21 recs.
20	Klymko, J. Henry Hensel's Butterfly Collection Database. Atlantic Canada Conservation Data Centre. 2016.
20	Kouchibouguac National Park, Natural Resource Conservation Sec. 1988. The Resources of Kouchibouguac National Park. Beach, H. (ed.) , 90 recs.
19	Mazerolle, M.J., Drolet, B., & Desrochers, A. 2001. Small Mammal Responses to Peat Mining of Southeastern Canadian Bogs. Can. J. Zool., 79:296-302. 21 recs.
18	Shortt, R. Connell Herbarium Black Ash specimens. University New Brunswick, Fredericton. 2019.
18	Toner, M. 2005. Lynx Records 1996-2005. NB Dept of Natural Resources, 48 recs.
17	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
17	Boyne, A.W. 2000. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 168 recs.
17	Webster, R.P. Database of R.P. Webster butterfly collection. 2017.
16	Majka, C. 2009. Université de Moncton Insect Collection: Carabidae, Cerambycidae, Coccinellidae. Université de Moncton, 540 recs.
15	Belland, R.J. 1992. The Bryophytes of Kouchibouguac National Park. Parks Canada, Kouchibouguac NP, 101 pp. + map.

# recs	CITATION
15	Chiasson, R. & Dietz, S. 1998. Piper Project Report of Common Tern Observations. Corvus Consulting, Tabusintac NB, 20 recs.
15	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
15	Sabine, M. 2016. Black Ash records from NB DNR permanent forest sampling Plots. New Brunswick Department of Natural Resources, 39 recs.
15	Webster, R.P. & Edsall, J. 2007. 2005 New Brunswick Rare Butterfly Survey. Environmental Trust Fund, unpublished report, 232 recs.
14	Morton, L.D. & Savoie, M. 1983. The Mammals of Kouchibouguac National Park. Parks Canada Report prep. by Canadian Wildlife Service, Sackville, NB, Vols 1-4. 14 recs.
14	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
14	Wallace, S. 2020. Stewardship Department species occurrence data on NTNB preserves. Nature Trust of New Brunswick.
13	David, M. 2000. CNPA website. Club de naturalistes de la Peninsule acadienne (CNPA), www.francophone.net/cnpa/rares. 16 recs.
13	Doucet, D.A. & Edsall, J.; Brunelle, P.-M. 2007. Miramichi Watershed Rare Odonata Survey. New Brunswick ETF & WTF Report, 1211 recs.
12	Madden, A. 1998. Wood Turtle records in northern NB. New Brunswick Dept of Natural Resources & Energy, Campbellton, Pers. comm. to S.H. Gerriets. 16 recs.
12	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
11	Canadian Wildlife Service, Atlantic Region. 2010. Piping Plover censuses 2006-09. , 35 recs.
11	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
11	Honeyman, K. 2019. Unique Areas Database, 2018. J.D. Irving Ltd.
11	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
11	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
11	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/buttrfly. 142 recs.
11	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
10	Churchill, J.L. 2019. Atlantic Canada Conservation Data Centre Fieldwork 2019. Atlantic Canada Conservation Data Centre.
10	Tremblay, E. 2001. Kouchibouguacis River Freshwater Mussel Data. Parks Canada, Kouchibouguac NP, 45 recs.
10	Webster, R.P. 2001. R.P. Webster Collection. R. P. Webster, 39 recs.
9	Bateman, M.C. 2000. Waterfowl Brood Surveys Database, 1990-2000 . Canadian Wildlife Service, Sackville, unpublished data. 149 recs.
9	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
9	Dept of Fisheries & Oceans. 1999. Status of Wild Striped Bass, & Interaction between Wild & Cultured Striped Bass in the Maritime Provinces. , Science Stock Status Report D3-22. 13 recs.
9	Gautreau-Daigle, H. 2007. Rare plant records from peatland surveys. Coastal Zones Research Institute, Shippagan NB. Pers. comm. to D.M. Mazerolle, 39 recs.
8	Chiasson, H. 2007. Les Papillons diurnes. NB Naturalist, 34(1): 4-7.
8	Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs.
8	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
8	Sollows, M.C. Export of New Brunswick Museum butterfly records for the Maritimes provinces. New Brunswick Museum. 2016.
7	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
7	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
7	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
7	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
7	Mawhinney, K. & Seutin, G. 2001. Lepidoptera Survey of the Salt Marshes of of Kouchibouguac National Park. Parks Canada Unpublished Report, 5p. 9 recs.
7	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
7	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
7	Robinson, S.L. 2010. Fieldwork 2009 (dune ecology). Atlantic Canada Conservation Data Centre. Sackville NB, 408 recs.
7	Toner, M. 2005. NB DNR fieldwork on Parker's Pipewort. NB Dept of Natural Resources. Pers. comm to C.S. Blaney, Dec 12, 8 recs.
6	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2000.
6	Cronin, P. & Ayer, C.; Dubee, B.; Hooper, W.C.; LeBlanc, E.; Madden, A.; Pettigrew, T.; Seymour, P. 1998. Fish Species Management Plans (draft). NB DNRE Internal Report. Fredericton, 164pp.
6	Doucet, D.A. 2008. Fieldwork 2008: Odonata. ACCDC Staff, 625 recs.
6	Doucet, D.A. 2008. Wood Turtle Records 2002-07. Pers. comm. to S. Gerriets, 7 recs, 7 recs.
6	Gowan, S. 1980. The Lichens of Kouchibouguac National Park, Parts I (Macrolichens) & II (Microlichens). National Museum of Natural Sciences. Ottawa, ON, 7 recs.
6	McLeod, D. & Merrithew, C. 2005. The Inventory of the Flora and Fauna of the French Fort Cove Nature Park. French Fort Cove Development Commission, 7 recs.
6	Sabine, M. 2016. NB DNR staff incidental Black Ash observations. New Brunswick Department of Natural Resources.
6	Sollows, M.C,. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
5	Benedict, B. Connell Herbarium Specimens, Digital photos. University New Brunswick, Fredericton. 2005.
5	Chaput, G. 1999. Atlantic Salmon: Miramichi & SFA 16 Rivers. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-05. 6 recs.
5	Donell, R. 2008. Rare plant records from rare coastal plant project. Bouctouche Dune Irving Eco-centre. Pers. comm. to D.M. Mazerolle, 50 recs.
5	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
5	Holder, M. & Kingsley, A.L. 2000. Peatland Insects in NB & NS: Results of surveys in 10 bogs during summer 2000. Atlantic Canada Conservation Data Centre, Sackville, 118 recs.
5	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2003-11. Atlantic Canada Conservation Data Centre. Sackville NB, 1337 recs.
5	Mazerolle, D. 2003. Assessment of Seaside Pinweed (Lechea maritima var. subcylindrica) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 18 recs.
5	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
5	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
5	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
5	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
4	Amirault, D.L. 1997-2000. Unpublished files. Canadian Wildlife Service, Sackville, 470 recs.

# recs	CITATION
4	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
4	Dalton, M. & Saba, B.A. 1980. A preliminary report on the natural history of the Gaspé shrew. The Atlantic Center for the Environment, Ipwich, MA, 29 pp.
4	Haughian, S. 2019. Pannaria lurida observations in Nova Scotia and New Brunswick. Nova Scotia Museum.
4	Hoyt, J.S. 2001. Assessment and update status report on the Bathurst Aster (Symphyotrichum subulatum) in Canada. Committee on the Status of Endangered Wildlife in Canada, 4 recs.
4	McLeod, D. & Saunders, J. 2004. Cypripedium reginae. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
4	Webster, R.P. 1997. Status Report on Maritime Ringlet (Coenonympha nipisquit) in Canada. Committee on the Status of Endangered Wildlife in Canada, 4 recs.
3	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
3	Gautreau, R. 2005. Betula michauxii occurrence on Bog 324, near Baie-Ste-Anne, NB. Pers. comm. to C.S. Blaney, 3 recs.
3	Godbout, V. 2000. Recherche de l'Aster du St-Laurent (Aster laurentianus) et du Satyre des Maritimes (Coenonympha nepisiquit) au Parc national Kouchibouguac et a Dune du Bouctouche, N-B. Irving Eco-centre, 23 pp.
3	Godbout, Valerié. 2010. Étude de l'Aster du Saint-Laurent dans le parc national Kouchibouguac, 2000-04. Parks Canada, 3 recs.
3	Klymko, J. Univeriste de Moncton insect collection butterfly record dataset. Atlantic Canada Conservation Data Centre. 2017.
3	Mazerolle, D. 2003. Assessment and Rehabilitation of the Gulf of St Lawrence Aster (Symphyotrichum laurentianum) in Southeastern New Brunswick. Irving Eco-centre, la Dune du Bouctouche, 13 recs.
3	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
3	Nelson Poirier. 2009. Rare plant finds in the Exmoor & Lyttleton areas. Pers. comm. to S. Blaney. 4 recs, 4 recs.
3	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
3	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
3	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.
3	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
3	Vladimir King Trajkovic. 2018. Brook Floater (Alasmidonta varicosa) records from MREAC surveys 2010-2017. Miramichi River Environmental Assessment Committee.
2	Anon. Dataset of butterfly records for the Maritime provinces. Museum of Comparative Zoology, Harvard University. 2017.
2	Bouchard, A. Herbier Marie-Victorin. Universite de Montreal, Montreal QC. 1999.
2	Chiasson, H. 2008. Les papillons diurnes. NB Naturalist, 35(1): 10.
2	Chiasson, R. 2018. Breeding bird observations from NBWTF project. pers. comm. to S. Blaney.
2	Consortium of North American Lichen Herbaria. 2018. Cetraria ericetorum records from CNALH. CNALH, 3.
2	Gauvin, J.M. 1979. Etude de la vegetation des marais sales du parc national Kouchibouguac, N-B. M.Sc. Thesis, Universite de Moncton, 248 pp.
2	Goltz, J.P. 2002. Botany Ramblings: 1 July to 30 September, 2002. N.B. Naturalist, 29 (3):84-92. 7 recs.
2	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
2	NatureServe Canada. 2017. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
2	NatureServe Canada. 2018. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
2	Sollows, M.C,. 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
2	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
1	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
1	Belliveau, A.G. E.C. Smith Herbarium Specimen Database 2019. E.C. Smith Herbarium, Acadia University. 2019.
1	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
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	Brunelle, P.-M. 2005. Wood Turtle observations. Pers. comm. to S.H. Gerriets, 21 Sep. 3 recs, 3 recs.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	Clayden, S.R. 2012. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 57 recs.
1	Collins, H. 2014. Email to John Klymko regarding CHELserp record from Miramichi watershed. Miramichi River Environmental Assessment Committee, 1 record.
1	Cormier, R. 2019. Wood Turtle observation. pers. comm. to J.L. Churchill.
1	Daury, R.W. & Bateman, M.C. 1996. The Barrow's Goldeneye (Bucephala islandica) in the Atlantic Provinces and Maine. Canadian Wildlife Service, Sackville, 47pp.
1	DeMerchant, A. 2019. Bank Swallow colony observation. NB Department of Energy and Resource Development, Pers. comm. to J.L. Churchill.
1	Desilets-Starrak, J. 2015. Wood Turtle record. Pers. comm. to E. Tremblay, Parks Canada.
1	Douglas, S.G. & G.C. Chaput & R. Bradford. 2001. Status of Striped Bass (Morone saxatilis) in the southern Gulf of St. Lawrence in 1999 & 2000. DFO Canadian Science Advisory Secretariat Res. Doc. 2001/058, 2001/058. 1 rec.
1	Edsall, J. 1993. Summer 1993 Report. New Brunswick Bird Info Line, 2 recs.
1	Elderkin, M. 2001. Bog Lemming record for Popple Depot NB. , Pers. comm. to K.A. Bredin. 1 rec.
1	Forster, J. 1999. [Story about Lynx in New Brunswick]. Moncton Times & Transcript, November 5, 1999. 1 rec.
1	Goltz, J.P. 2007. Field Notes: Listera australis at Kouchibouguac National Park. , 7 recs.
1	Grondin, P. & Blouin, J-L., Bouchard, D.; et al. 1981. Description et cartographie de la vegetation du cordon littoral. Parc National de Kouchibouguac. Le Groupe Dryade, 57 pp.
1	Hinds, H.R. 2000. Flora of New Brunswick (2nd Ed.). University New Brunswick, 694 pp.
1	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
1	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
1	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
1	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.
1	MacKinnon, C.M. 2000. Inspection visit to Inkerman MBS, June 5, 2000. Canadian Wildlife Service, Sackville, 1 rec.

# recs	CITATION
1	Mazerolle, D.M. Small-flowered Agalinis collection from Quarryville. AC CDC. 2018.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
1	New York Botanical Garden. 2006. Virtual Plant Herbarium - Vascular Plant Types Catalog. Sylva, S.; Kallunki, J. (ed.) International Plant Science Centre, Web site: http://sciweb.nybg.org/science2/vii2.asp. 4 recs.
1	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
1	Saunders, J. 2009. White-Fringe Orchis photo and coordinates. Pers. comm. to S. Blaney, July 17. 1 rec, 1 rec.
1	Simpson, D. Collection sites for Black Ash seed lots preserved at the National Tree Seed Centre in Fredericton NB. National Tree Seed Centre, Canadian Forest Service. 2016.
1	Toner, M. 2009. Wood Turtle Sightings. NB Dept of Natural Resources. Pers. comm. to S. Gerriets, Jul 13 & Sep 2, 2 recs.
1	Tremblay, E., Craik, S.R., Titman, R.D., Rousseau, A. & Richardson, M.J. 2006. First Report of Black Terns Breeding on a Coastal Barrier Island. Wilson Journal of Ornithology, 118(1):104-106. 1 rec.
1	Wisniowski, C. & Dowding, A. 2020. NB species occurrence data for 2020. Nature Trust of New Brunswick.
1	Young, A.D., Titman, R.D. 1986. Costs and benefits to Red-breasted Mergansers nesting in tern and gull colonies. Can. J. Zool., 64: 2339-2343.

Appendix B

List of Vegetation Species

Table B.1: Regionally Rare Plant Species Historically Observed within 5 km of the Project Site Area (AC CDC 2021)				
Species	**Provincial S Ranking**	**SARA/NB SARA/ COSEWIC Status**	**Habitat and Flowering Times**	**Potential to Occur in Project Site area**
Agrostis mertensii Norther Brent Grass	S2	-	Alpine or subalpine zones on cliffs or ledges (Hinds 2000).	**Possible** - There is potential on the rock cliffs near the Tailrace area of the Project.
Boechera stricta Drummond's Rockcress	S2	-	Dry sandy or rock outcrops (Hinds 2000). Flowers in spring (Munro et al. 2014).	**Known** - The species has historically identified within the Project site area (AC CDC 2021).
Carex adusta Lesser Brown Sedge	S2S3	-	Dry sandy soils of disturbed sites (Hinds 2000).	**Probable** - The species has potential as the Project site area has been an active and therefore a disturbed site.
Carex garberi Garber's Sedge	S3	-	Wet sandy shores of lakes or rivers (Hinds 2000).	**Possible** - There is potential for this species along the shores of the Project area; however they are more rocky than sandy.
Dichanthelium depauperatum Starved Panic Grass	S3	-	Dry soils of woodlands or rocky slopes (Hinds 2000).	**Probable** - Both types of prefered habitat exist in the Project area however they will be minimally by site activites.
Dichanthelium linearifolium Narrow-leaved Panic Grass	S2	-	Sandy softwood groves on gravel banks androadsides (Hinds 2000).	Unlikely - This habitat is not anticipated to be within the Project site.
Drymocallis arguta Tall Wood Beauty	S3S4	-	Meadows, shores of lakes or rivers, rocky slopes (Hinds 2000). Flowers in summer (Munro et al. 2014).	**Possible** - No meadow habitat but river shore and rocky slopes present within the Project area.
Epilobium hornemannii Hornemann's Willowherb	S3	-	Meadows and wetlands but occasionaly on shores of rivers and lakes (Hinds 200). Flowers in summer (Munro et al. 2014).	Unlikely - Meadows and wetlands not anticipated to be within the Project site, some potential along the shore of river.
Fraxinus nigra Black Ash	S4S5	COSEWIC: Threatened	Rich hardwoods (Hinds 2000).	**Possible** - There is some hardwood habitat within the Project area however it is unlikely to be considered "rich".
Ionactis linariifolia Flax-leaved Aster	S2	-	Dry well-drained soil and rocky banks with minimal shade (Hinds 2000). Flowers in late summer (Munro et al. 2014).	**Probable** - This habitat ocurs in abundance throughout the Project site area.
Rosa acicularis Prickly Rose	S2	-	Dry to moist soil on edges of woodlands or rocky banks of rivers and lakes (Hinds 2000). Flowers in summer (Munro et al. 2014).	**Possible** - Has wide range of acceptable conditions and some occur in the Project area.
Stachys pilosa Hairy Hedge-Nettle	S3S4	-	Wet soils in meadows and wetlands and along sandy lakeshores (Hinds 2000). Flowers in summer (Munro et al. 2014).	Unlikely - This habitat is not anticipated to be within the Project site.
Stellaria longifolia Long-leaved Starwort	S2	-	Wet soils in meadows, swamps and moist forests (Hinds 2000). Flowers in early summer (Munro et al. 2014).	Unlikely - This habitat is not anticipated to be within the Project site.
Trichophorum clintonii Clintons Clubrush	S3	-	Dry sandy soils in fields, forest clearings or hillsides and banks (Hinds 2000). Flowers in summer (Munro et al. 2014).	**Possible** - There is potential for this species to occur within the Project area; however it is not the primary habitat.
Turritis glabra Tower Mustard	S3	-	Dry soils in fields, on edges of forests or roadsides (Hinds 2000). Flowers in spring (Munro et al. 2014).	**Probable** - There is potential for this species to occur within the Project area.

Table B.2: List of Vegetation Species Observed During Nepsiguit Falls Generating Station Vegetation Surveys, June 9, July 6, and July 7, 2021

Scientific Name	Common Name	AC CDC S-Rank	Provincial Rank
Abies balsamea	Balsam Fir	S5	Secure
Acer pensylvanicum	Striped Maple	S5	Secure
Acer rubrum	Red Maple	S5	Secure
Acer saccharinum	Silver Maple	S4	Secure
Acer spicatum	Mountain Maple	S5	Secure
Achillea millefolium	Common Yarrow	SNA	Exotic
Actaea rubra	Red Baneberry	S5	Secure
Alnus incana	Speckled Alder	S5	Secure
Ambrosia artemisiifolia	Common Ragweed	S5	Secure
Amelanchier bartramiana	Bartram's Serviceberry	S5	Secure
Anaphalis margaritacea	Pearly Everlasting	S5	Secure
Anemonastrum canadense	Canada Anemone	S5	Secure
Anemone multifida	Cut-leaved Anemone	S2	Sensitive
Anemone quinquefolia	Wood Anemone	S4	Secure
Angelica sylvestris	Woodland Angelica	SNA	Exotic
Apocynum androsaemifolium	Spreading Dogbane	S5	Secure
Apocynum cannabinum	Hemp Dogbane	S4	Secure
Aralia nudicaulis	Wild Sarsaparilla	S5	Secure
Arctium lappa	Great Burdock	SNA	Exotic
Arisaema triphyllum	Jack-in-the-pulpit	S5	Secure
Athyrium filix-femina	Common Lady Fern	S5	Secure
Betula alleghaniensis	Yellow Birch	S5	Secure
Betula cordifolia	Heart-leaved Birch	S5	Secure
Betula papyrifera	Paper Birch	S5	Secure
Bidens frondosa	Devil's Beggarticks	S5	Secure
Boechera stricta	Drummond's Rockcress	S2	Sensitive
Boechera stricta	Drummond's Rockcress	S2	Sensitive
Boechera stricta	Drummond's Rockcress	S2	Sensitive
Calamagrostis canadensis	Bluejoint Reed Grass	S5	Secure
Caltha palustris	Yellow Marsh Marigold	S4S5	Secure
Carex communis	Fibrous-Root Sedge	S5	Secure
Carex arctata	Black Sedge	S5	Secure
Carex brunnescens	Brownish Sedge	S5	Secure
Carex canescens	Silvery Sedge	S5	Secure
Carex crinita	Fringed Sedge	S5	Secure
Carex debilis	White-edged Sedge	S5	Secure
Carex deweyana	Dewey's Sedge	S5	Secure
Carex echinata	Star Sedge	S5	Secure
Carex gynandra	Nodding Sedge	S5	Secure
Carex intumescens	Bladder Sedge	S5	Secure
Carex lurida	Sallow Sedge	S5	Secure
Carex pseudocyperus	Cyperuslike Sedge	S5	Secure

Table B.2: List of Vegetation Species Observed During Nepsiguit Falls Generating Station Vegetation Surveys, June 9, July 6, and July 7, 2021

Carex scoparia	Broom Sedge	S5	Secure
Carex stipata	Awl-fruited Sedge	S5	Secure
Chamaenerion angustifolium	Fireweed	S5	Secure
Chelone glabra	White Turtlehead	S5	Secure
Chimaphila umbellata	Common Pipsissewa	S5	Secure
Chrysosplenium americanum	American Golden Saxifrage	S5	Secure
Cicuta bulbifera	Bulbous Water-hemlock	S5	Secure
Cinna latifolia	Drooping Wood Reed Grass	S5	Secure
Clematis virginiana	Virginia Clematis	S5	Secure
Clintonia borealis	Yellow Bluebead Lily	S5	Secure
Coptis trifolia	Goldthread	S5	Secure
Cornus alternifolia	Alternate-leaved Dogwood	S5	Secure
Cornus canadensis	Bunchberry	S5	Secure
Corylus cornuta	Beaked Hazel	S5	Secure
Crataegus spp.	Hawthorn		
Cypripedium acaule	Pink Lady's-Slipper	S5	Secure
Cystopteris fragilis	Fragile Fern	S4	Secure
Danthonia spicata	Poverty Oat Grass	S5	Secure
Dendrolycopodium dendroideum	Round-branched Tree-clubmoss	S5	Secure
Dichanthelium boreale	Northern Panic Grass	S5	Secure
Diervilla lonicera	Northern Bush Honeysuckle	S5	Secure
Drosera rotundifolia	Round-leaved Sundew	S5	Secure
Dryopteris carthusiana	Spinulose Wood Fern	S5	Secure
Dryopteris cristata	Crested Wood Fern	S5	Secure
Dryopteris intermedia	Evergreen Wood Fern	S5	Secure
Eleocharis acicularis	Needle Spikerush	S5	Secure
Epigaea repens	Trailing Arbutus	S5	Secure
Epilobium parviflorum	Small-flowered Willowherb	SNA	
Equisetum arvense	Field Horsetail	S5	Secure
Erigeron strigosus	Rough Fleabane	S5	Secure
Erythronium americanum	Yellow Trout Lily	S5	Secure
Eupatorium perfoliatum	Common Boneset	S5	Secure
Fagus grandifolia	American Beech	S4	Secure
Fragaria virginiana	Wild Strawberry	S5	Secure
Frangula alnus	Glossy Buckthorn	SNA	Exotic
Fraxinus americana	White Ash	S4S5	Secure
Galium mollugo	Smooth Bedstraw	SNA	Exotic
Galium trifidum	Three-petaled Bedstraw	S5	Secure
Galium triflorum	Three-flowered Bedstraw	S5	Secure
Gaultheria hispidula	Creeping Snowberry	S5	Secure
Glyceria borealis	Northern Manna Grass	S5	Secure
Glyceria canadensis	Canada Manna Grass	S5	Secure
Gnaphalium uliginosum	Marsh Cudweed	SNA	Exotic
Goodyera repens	Lesser Rattlesnake-plantain	S4	Secure

Table B.2: List of Vegetation Species Observed During Nepsiguit Falls Generating Station Vegetation Surveys, June 9, July 6, and July 7, 2021

Gymnocarpium dryopteris	Common Oak Fern	S5	Secure
Heracleum maximum	Common Cow Parsnip	S5	Secure
Hypericum fraseri	Fraser's St. John's-wort	S5	Secure
Hypopitys monotropa	Pinesap	S4	Secure
Ilex mucronata	Mountain Holly	S5	Secure
Impatiens capensis	Spotted Jewelweed	S5	Secure
Iris versicolor	Harlequin Blue Flag	S5	Secure
Juncus brevicaudatus	Narrow-Panicled Rush	S5	Secure
Leersia oryzoides	Rice Cut Grass	S5	Secure
Lemna turionifera	Turion Duckweed	S5	Secure
Leucanthemum vulgare	Oxeye Daisy	SNA	Exotic
Linaria vulgaris	Butter-and-Eggs	SNA	Exotic
Linnaea borealis	Twinflower	S5	Secure
Lonicera canadensis	Canada Fly Honeysuckle	S5	Secure
Lonicera villosa	Mountain Fly Honeysuckle	S5	Secure
Lupinus polyphyllus	Large-Leaved Lupine	SNA	Exotic
Luzula multiflora	Common Woodrush	S5	Secure
Lycopodium annotinum	Stiff Clubmoss	S5	Secure
Lycopodium clavatum	Running Clubmoss	S5	Secure
Lycopus uniflorus	Northern Water Horehound	S5	Secure
Lysimachia borealis	Northern Starflower	S5	Secure
Lysimachia ciliata	Fringed Yellow Loosestrife	S5	Secure
Lysimachia terrestris	Swamp Yellow Loosestrife	S5	Secure
Maianthemum canadense	Wild Lily-of-The-Valley	S5	Secure
Maianthemum racemosum	Large False Solomon's Seal	S5	Secure
Matricaria discoidea	Pineapple Weed	SNA	Exotic
Medeola virginiana	Cucumber Root	S5	Secure
Melampyrum lineare	American Cow Wheat	S5	Secure
Melilotus albus	White Sweet-clover	SNA	Exotic
Mimulus ringens	Square-stemmed Monkeyflower	S5	Secure
Monotropa uniflora	Convulsion-Root	S5	Secure
Myrica gale	Sweet Gale	S5	Secure
Nabalus trifoliolatus	Three-leaved Rattlesnakeroot	S5	Secure
Oclemena acuminata	Whorled Wood Aster	S5	Secure
Oenothera biennis	Common Evening Primrose	S5	Secure
Onoclea sensibilis	Sensitive Fern	S5	Secure
Osmunda claytoniana	Interrupted Fern	S5	Secure
Osmundastrum cinnamomeum	Cinnamon Fern	S5	Secure
Oxalis montana	Common Wood Sorrel	S5	Secure
Phalaris arundinacea	Reed Canary Grass	S5	Secure
Phleum pratense	Common Timothy	SNA	Exotic
Picea glauca	White Spruce	S5	Secure
Pilosella officinarum	Mouse-ear Hawkweed	SNA	Exotic
Pinus strobus	Eastern White Pine	S5	Secure

Table B.2: List of Vegetation Species Observed During Nepsiguit Falls Generating Station Vegetation Surveys, June 9, July 6, and July 7, 2021

Plantago major	Common Plantain	SNA	Exotic
Poa compressa	Canada Blue Grass	SNA	Exotic
Poa pratensis	Kentucky Blue Grass	S5	Secure
Pontederia cordata	Pickerelweed	S5	Secure
Populus balsamifera	Balsam Poplar	S5	Secure
Populus grandidentata	Large-toothed Aspen	S5	Secure
Populus tremuloides	Trembling Aspen	S5	Secure
Potentilla norvegica	Rough Cinquefoil	S5	Secure
Potentilla simplex	Old Field Cinquefoil	S5	Secure
Prunella vulgaris	Common Self-heal	S5	Secure
Prunus virginiana	Chokecherry	S5	Secure
Pteridium aquilinum	Bracken Fern	S5	Secure
Pyrola elliptica	Shinleaf	S5	Secure
Quercus rubra	Northern Red Oak	S5	Secure
Ranunculus hispidus	Bristly Buttercup	S4S5	Secure
Ranunculus repens	Creeping Buttercup	SNA	Exotic
Rhus typhina	Staghorn Sumac	S5	Secure
Ribes glandulosum	Skunk Currant	S5	Secure
Ribes lacustre	Bristly Black Currant	S5	Secure
Rubus idaeus	Red Raspberry	S5	Secure
Rubus pubescens	Dwarf Red Raspberry	S5	Secure
Rumex acetosa	Garden Sorrel	SNA	Exotic
Rumex crispus	Curled Dock	SNA	Exotic
Salix bebbiana	Bebb's Willow	S5	Secure
Salix discolor	Pussy Willow	S5	Secure
Salix lutea	a Willow	SNA	
Scirpus atrocinctus	Black-girdled Bulrush	S5	Secure
Scirpus cyperinus	Common Woolly Bulrush	S5	Secure
Scirpus hattorianus	Mosquito Bulrush	S5	Secure
Scorzoneroides autumnalis	Autumn Hawkbit	SNA	Exotic
Scutellaria galericulata	Marsh Skullcap	S5	Secure
Scutellaria lateriflora	Mad-dog Skullcap	S5	Secure
Silene vulgaris	Bladder Campion	SNA	Exotic
Sium suave	Common Water Parsnip	S5	Secure
Solidago juncea	Early Goldenrod	S5	Secure
Solidago macrophylla	Large-leaved Goldenrod	S4	Secure
Solidago puberula	Downy Goldenrod	S5	Secure
Solidago rugosa	Rough-stemmed Goldenrod	S5	Secure
Sorbus americana	American Mountain Ash	S5	Secure
Spiraea alba	White Meadowsweet	S5	Secure
Symphyotrichum cordifolium	Heart-leaved Aster	S5	Secure
Symphyotrichum lanceolatum	Lance-leaved Aster	S5	Secure
Symphyotrichum puniceum	Purple-stemmed Aster	S5	Secure
Taraxacum officinale	Common Dandelion	SNA	Exotic

Table B.2: List of Vegetation Species Observed During Nepsiguit Falls Generating Station Vegetation Surveys, June 9, July 6, and July 7, 2021

Taxus canadensis	Canada Yew	S5	Secure
Thalictrum pubescens	Tall Meadow-Rue	S5	Secure
Thelypteris noveboracensis	New York Fern	S5	Secure
Thuja occidentalis	Eastern White Cedar	S5	Secure
Trifolium arvense	Rabbit's-foot Clover	SNA	Exotic
Trifolium pratense	Red Clover	SNA	Exotic
Trifolium repens	White Clover	SNA	Exotic
Trillium erectum	Red Trillium	S5	Secure
Trillium undulatum	Painted Trillium	S5	Secure
Tsuga canadensis	Eastern Hemlock	S5	Secure
Tussilago farfara	Coltsfoot	SNA	Exotic
Ulmus americana	White Elm	S4	Secure
Unknown forb			
Unknown forb			
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5	Secure
Verbascum thapsus	Common Mullein	SNA	Exotic
Veronica americana	American Speedwell	S5	Secure
Veronica officinalis	Common Speedwell	SNA	Exotic
Veronica scutellata	Marsh Speedwell	S5	Secure
Veronica serpyllifolia	Thyme-Leaved Speedwell	SNA	Secure
Viburnum lantanoides	Hobblebush	S5	Secure
Viburnum opulus	Highbush Cranberry	S4	Secure
Vicia cracca	Tufted Vetch	SNA	Exotic
Viola cucullata	Marsh Blue Violet	S5	Secure
Viola macloskeyi	Small White Violet	S5	Secure
Woodsia ilvensis	Rusty Cliff Fern	S4	Secure

Appendix C

Information on Consultation Activities Conducted to Date

NB Power News Release, July 5, 2021, Regarding Virtual Open House to be held on July 20, 2021

NEWS

NB Power hosting Open House on Nepisiguit Falls Generating Station

2021-07-05

Fredericton (NB) – NB Power is planning upgrades to the Nepisiguit Falls Generating Station to extend the life of the plant and put more renewable energy on the grid. This investment is part of a long-term plan to ensure New Brunswickers have clean, reliable energy at competitive prices for generations to come.

To provide the public with an opportunity to learn more, NB Power will host a virtual open house on July 20 commencing at 2:00pm Atlantic Standard Time. For details about the open house, please visit the Nepisiguit Falls Generating Station Life Extension Project website.

Consultations with the community and First Nations have already begun and will continue throughout all phases of the project.

"With this project, NB Power is upgrading this existing renewable energy source and adding 3 more megawatts of renewable energy to the grid," stated Keith Cronkhite, President NB Power. "Once the upgrades are complete, it will increase the life expectancy of the Nepisiguit Falls Generating Station by 50 years. This is a win for both our customers and the environment, we look forward to discussing this project more at our open house," added Cronkite

The Nepisiguit Falls Generating Station (NFGS) is a hydroelectric power generation station located on the Nepisiguit River 20 minutes south of Bathurst. The Station began operation in 1921, with NB Power purchasing the station in 2008. It consists of three (3) generating units with a current maximum output of 10.2 MW.

NB Power will be registering the Environmental Impact Assessment (EIA) for the project this summer. Following the permitting process, work is expected to begin in the summer of 2022.

Media Contacts:

Sheila Lagacé, Communications, NB Power, 506-458-2345 or SLagace@nbpower.com

NOUVELLES

Énergie NB cherche à obtenir l'avis du public sur la mise à niveau qui sera réalisée à la centrale de Nepisiguit Falls

2021-07-05

Fredericton (Nouveau-Brunswick) — Énergie NB envisage la mise à niveau à la centrale hydroélectrique de Nepisiguit Falls afin de prolonger la durée de vie utile de celle-ci et d'intégrer plus d'énergie renouvelable sur le réseau. Cet investissement s'inscrit dans un plan à long terme visant à faire en sorte que les Néo-Brunswickois aient une énergie propre et fiable à des prix concurrentiels pour les générations à venir.

Pour donner au public l'occasion de se renseigner davantage sur le projet, Énergie NB organisera une journée portes ouvertes virtuelle le 20 juillet à compter de 14 h, heure normale de l'Atlantique. Pour en savoir plus sur la journée portes ouvertes, veuillez consulter la page Web du projet de mise à niveau de la centrale de Nepisiguit Falls d'Énergie NB

L'entreprise de services publics a déjà entamé le processus de consultations avec la communauté et les Premières Nations ; des consultations auront lieu pour toutes les phases du projet.

« Dans le cadre de ce projet, Énergie NB renforcera la source d'énergie renouvelable existante et intègrera trois (3) mégawatts additionnels d'énergie renouvelable au réseau, déclare Keith Cronkhite, président-directeur d'Énergie NB. Lorsque les travaux seront terminés, la durée de vie utile de la centrale de Nepisiguit Falls sera prolongée de 50 ans. Il s'agit là d'une réalisation avantageuse tant pour nos clients que pour l'environnement. Nous avons hâte de discuter davantage de ce projet lors de notre journée portes ouvertes », ajoute Keith Cronkhite.

La centrale de Nepisiguit Falls est une centrale hydroélectrique située sur la rivière Nepisiguit, à 20 minutes au sud de Bathurst. La centrale a été mise en service en 1921 et Énergie NB en a fait l'acquisition en 2008. La centrale est composée de trois (3) tranches de production d'une puissance nominale totale de 10,2 MW.

Énergie NB enregistrera le projet à une étude d'impact sur l'environnement (EIE) cet été. À la suite du processus d'approbation, les travaux devraient commencer à l'été 2022.

Personnes-ressources des médias :

Sheila Lagacé, Communications, NB Power, 506-458-2345 or SLagace@nbpower.com

Telegraph Journal
Open House Invitation

Énergie NB Power

NOTICE

Virtual Open House
Nepisiguit Falls Generating Station Life Extension Project

The Nepisiguit Falls Generating Station is a hydroelectric power generation station located on the Nepisiguit River 20 minutes south of Bathurst. The Station began operation in 1921, with NB Power purchasing the station in 2008. It consists of three (3) generating units with a current maximum output of 10.2 MW.

NB Power is planning upgrades to this existing renewable energy source and adding 3 more megawatts of renewable energy to the grid. Once the upgrades are complete, it will increase the life expectancy of the Nepisiguit Falls Generating Station by 50 years.

NB Power is planning upgrades to the Nepisiguit Falls Generating Station to extend the life of the plant and put more renewable energy on the grid.

NB Power will host a virtual open house for the public on July 20 commencing at 2:00pm Atlantic Standard Time. To register to attend the open house and learn more, please visit the Nepisiguit Falls Generating Station Life Extension Project at **www.nbpower.com/nepisiguitproject**.

Comments and questions can be submitted directly to NB Power, 515 King Street, PO Box 2000, STN A Fredericton, NB E3B 4X1

Comments may also be submitted via email to **Nepisiguitproject@nbpower.com** or during the virtual Public Open House.

Brunswick News Open House Invitation

Énergie NB Power

AVIS

Journée portes ouvertes virtuelle
Projet de prolongation de la durée de vie de la centrale de Nepisiguit Falls

La centrale de Nepisiguit Falls est une centrale hydroélectrique située sur la rivière Nepisiguit, à 20 minutes au sud de Bathurst. La centrale a été mise en service en 1921, et Énergie NB en a fait l'acquisition en 2008. La centrale est composée de trois (3) tranches de production d'une puissance nominale totale de 10,2 MW.

Dans le cadre de ce projet, Énergie NB renforcera la source d'énergie renouvelable existante et intègrera trois (3) mégawatts additionnels d'énergie renouvelable au réseau. Lorsque les travaux seront terminés, la durée de vie utile de la centrale de Nepisiguit Falls sera prolongée de 50 ans.

Énergie NB envisage la mise à niveau à la centrale hydroélectrique de Nepisiguit Falls afin de prolonger la durée de vie utile de celle-ci et d'intégrer plus d'énergie renouvelable sur le réseau.

Énergie NB organisera une journée portes ouvertes virtuelle le 20 juillet à compter de 14 h, heure normale de l'Atlantique. Pour en savoir plus sur la journée portes ouvertes, ou pour vous y inscrire, veuillez consulter la page Web du projet de mise à niveau de la centrale de Nepisiguit Falls d'Énergie NB à **www.energienb.com/projetnepisiguit**.

Les questions et les commentaires peuvent être envoyés directement à Énergie NB au 515, rue King, C.P. 2000, succ. A, Fredericton (Nouveau-Brunswick) E3B 4X1.

Les commentaires peuvent également être envoyés par courriel à **Nepisiguitproject@nbpower.com**, ou être présentés pendant la journée portes ouvertes virtuelle.

Acadie Nouvelle Open House Invitation

Énergie NB Power

AVIS

Journée portes ouvertes virtuelle
Projet de prolongation de la durée de vie de la centrale de Nepisiguit Falls

La centrale de Nepisiguit Falls est une centrale hydroélectrique située sur la rivière Nepisiguit, à 20 minutes au sud de Bathurst. La centrale a été mise en service en 1921, et Énergie NB en a fait l'acquisition en 2008. La centrale est composée de trois (3) tranches de production d'une puissance nominale totale de 10,2 MW.

Dans le cadre de ce projet, Énergie NB renforcera la source d'énergie renouvelable existante et intègrera trois (3) mégawatts additionnels d'énergie renouvelable au réseau. Lorsque les travaux seront terminés, la durée de vie utile de la centrale de Nepisiguit Falls sera prolongée de 50 ans.

Énergie NB envisage la mise à niveau à la centrale hydroélectrique de Nepisiguit Falls afin de prolonger la durée de vie utile de celle-ci et d'intégrer plus d'énergie renouvelable sur le réseau.

Énergie NB organisera une journée portes ouvertes virtuelle le 20 juillet à compter de 14 h, heure normale de l'Atlantique. Pour en savoir plus sur la journée portes ouvertes, ou pour vous y inscrire, veuillez consulter la page Web du projet de mise à niveau de la centrale de Nepisiguit Falls d'Énergie NB à **www.energienb.com/projetnepisiguit**.

Les questions et les commentaires peuvent être envoyés directement à Énergie NB au 515, rue King, C.P. 2000, succ. A, Fredericton (Nouveau-Brunswick) E3B 4X1.

Les commentaires peuvent également être envoyés par courriel à **Nepisiguitproject@nbpower.com**, ou être présentés pendant la journée portes ouvertes virtuelle.

Post from NB Power's Facebook Page

NB Power / Énergie NB
July 19 ·

Tomorrow is our Nepisiguit Falls Generating Station Life Extension Project virtual open house! This project is part of a long-term plan to ensure New Brunswickers have clean and reliable energy at competitive costs for generations to come. Are you interested in learning more? The open house takes place tomorrow, July 20 at 2:00 p.m. Sign up here! http://ow.ly/xVzq50FyWgV

Demain ! : séance portes ouvertes virtuelle sur le projet de prolongation de la durée de vie utile de la centrale de Nepisiguit Falls. Ce projet fait partie d'un investissement qui s'inscrit dans un plan à long terme visant à garantir aux futures générations du Nouveau-Brunswick une énergie propre et fiable à des prix concurrentiels. Vous voulez en savoir plus ? La séance portes ouvertes virtuelle a lieu demain, le mardi 20 juillet, à 14 h. Inscrivez-vous ici ! https://www.energienb.com/projetnepisiguit/. See less

9 1 Share

Like Comment Share

Write a comment...

Invitation to Landowners Regarding Open House

Invitation

The Nepisiguit Falls Generating Station is a hydroelectric power generation station located on the Nepisiguit River 20 minutes south of Bathurst. The Station began operation in 1921 and was purchased by NB Power in 2008. It consists of three generating units with a current maximum output of 10.2 MW.

NB Power is planning upgrades to the Nepisiguit Falls Generating Station to extend the life of the plant and increase renewable energy on the grid. This investment is part of our long-term plan to ensure New Brunswickers have clean, reliable energy at competitive prices for generations to come.

With this project, NB Power is upgrading this existing renewable energy source and adding three more megawatts of renewable energy to the grid. Once the upgrades are complete, it will increase the life expectancy of the Nepisiquit Falls Generating Station by 50 years.

To provide local landowners and the public with an opportunity to learn more, NB Power will host a virtual open house on Tuesday, July 20 commencing at 2:00pm Atlantic Standard Time. For further details and to register for the open house, please visit the Nepisiquit Falls Generating Station Life Extension Project website at https://www.nbpower.com/nepisiguitproject

.

Consultations with First Nations have already begun and will continue throughout all phases of the project.

NB Power will be registering the Environmental Impact Assessment (EIA) for the project and applying for a Fisheries Act Authorization (FAA) later this summer. Following the permitting process, work is expected to begin in the summer of 2022.

Thank you for your interest.

Nepisiguit Falls Generating Station Life Extension Project Team
NB Power

Invitation

La centrale de Nepisiguit Falls est une centrale hydroélectrique située sur la rivière Nepisiguit, à 20 minutes au sud de Bathurst. La centrale a été mise en service en 1921, et Énergie NB en a fait l'acquisition en 2008. La centrale est composée de trois (3) tranches de production d'une puissance nominale totale de 10,2 MW.

Fredericton (Nouveau-Brunswick) — Énergie NB envisage la mise à niveau à la centrale hydroélectrique de Nepisiguit Falls afin de prolonger la durée de vie utile de celle-ci et d'intégrer plus d'énergie renouvelable sur le réseau. Cet investissement s'inscrit dans un plan à long terme visant à faire en sorte que les Néo-Brunswickois aient une énergie propre et fiable à des prix concurrentiels pour les générations à venir.

Dans le cadre de ce projet, Énergie NB renforcera la source d'énergie renouvelable existante et intègrera trois (3) mégawatts additionnels d'énergie renouvelable au réseau. Lorsque les travaux seront terminés, la durée de vie utile de la centrale de Nepisiguit Falls sera prolongée de 50 ans.

Pour donner aux propriétaires fonciers locaux et au public l'occasion de se renseigner davantage sur le projet, Énergie NB organisera une journée portes ouvertes virtuelle le 20 juillet à compter de 14 h, heure normale de l'Atlantique. Pour en savoir plus sur la journée portes ouvertes, ou pour vous y inscrire, veuillez consulter la page Web du projet de mise à niveau de la centrale de Nepisiguit Falls d'Énergie NB.

L'entreprise de services publics a déjà entamé le processus de consultations avec la communauté et les Premières Nations ; des consultations auront lieu pour toutes les phases du projet.

Énergie NB enregistrera le projet à une étude d'impact environnemental (EIE) du projet et obtenir une autorisation aux termes de la *Loi sur les pêches* plus tard cet été. À la suite du processus d'approbation, les travaux devraient commencer à l'été 2022.

Merci pour votre intérêt.

Invitation to Stakeholders Regarding Open House

Subject: Invitation – Virtual Open House for the Nepisiguit Falls Generating Station Life Extension Project

Friends of the Nepisiguit Falls Generating Station,

The Nepisiguit Falls Generating Station is a hydroelectric power generation station located on the Nepisiguit River 20 minutes south of Bathurst. The Station began operation in 1921 and was purchased by NB Power in 2008. It consists of three (3) generating units with a current maximum output of 10.2 MW.

NB Power is planning upgrades to the Nepisiguit Falls Generating Station to extend the life of the plant and increase renewable energy on the grid. This investment is part of our long-term plan to ensure New Brunswickers have clean, reliable energy at competitive prices for generations to come.

With this project, NB Power is upgrading this existing renewable energy source and adding three more megawatts of renewable energy to the grid. Once the upgrades are complete, it will increase the life expectancy of the Nepisiquit Falls Generating Station by 50 years.

To provide local landowners and the public with an opportunity to learn more, NB Power will host a virtual open house on Tuesday, July 20 commencing at 2:00pm Atlantic Standard Time. For further details and to register for the open house, please visit the Nepisiguit Falls Generating Station Life Extension Project website.

Consultations with First Nations have already begun and will continue throughout all phases of the project.

NB Power will be registering the Environmental Impact Assessment (EIA) for the project and applying for a Fisheries Act Authorization (FAA) later this summer. Following the permitting process, work is expected to begin in the summer of 2022.

Thank you for your interest,

Nepisiguit Falls Generating Station Life Extension Project Team
NB Power

Objet : Invitation à la journée portes ouvertes virtuelle sur le projet de prolongation de la durée de vie de la centrale de Nepisiguit Falls

Chers amis de la centrale de Nepisiguit Falls,

La centrale de Nepisiguit Falls est une centrale hydroélectrique située sur la rivière Nepisiguit, à 20 minutes au sud de Bathurst. La centrale a été mise en service en 1921, et Énergie NB en a fait l'acquisition en 2008. La centrale est composée de trois (3) tranches de production d'une puissance nominale totale de 10,2 MW.

Énergie NB envisage la mise à niveau à la centrale hydroélectrique de Nepisiguit Falls afin de prolonger la durée de vie utile de celle-ci et d'intégrer plus d'énergie renouvelable sur le réseau. Cet investissement s'inscrit dans un plan à long terme visant à faire en sorte que les Néo-Brunswickois aient une énergie propre et fiable à des prix concurrentiels pour les générations à venir.

Dans le cadre de ce projet, Énergie NB renforcera la source d'énergie renouvelable existante et intègrera trois (3) mégawatts additionnels d'énergie renouvelable au réseau. Lorsque les travaux seront terminés, la durée de vie utile de la centrale de Nepisiguit Falls sera prolongée de 50 ans.

Pour donner aux propriétaires fonciers locaux et au public l'occasion de se renseigner davantage sur le projet, Énergie NB organisera une journée portes ouvertes virtuelle le 20 juillet à compter de 14 h, heure normale de l'Atlantique. Pour en savoir plus sur la journée portes ouvertes, ou pour vous y inscrire, veuillez consulter la page Web du projet de mise à niveau de la centrale de Nepisiguit Falls d'Énergie NB

L'entreprise de services publics a déjà entamé le processus de consultations avec la communauté et les Premières Nations ; des consultations auront lieu pour toutes les phases du projet.

Énergie NB enregistrera le projet à une étude d'impact environnemental (EIE) du projet et obtenir une autorisation aux termes de la Loi sur les pêches plus tard cet été. À la suite du processus d'approbation, les travaux devraient commencer à l'été 2022.

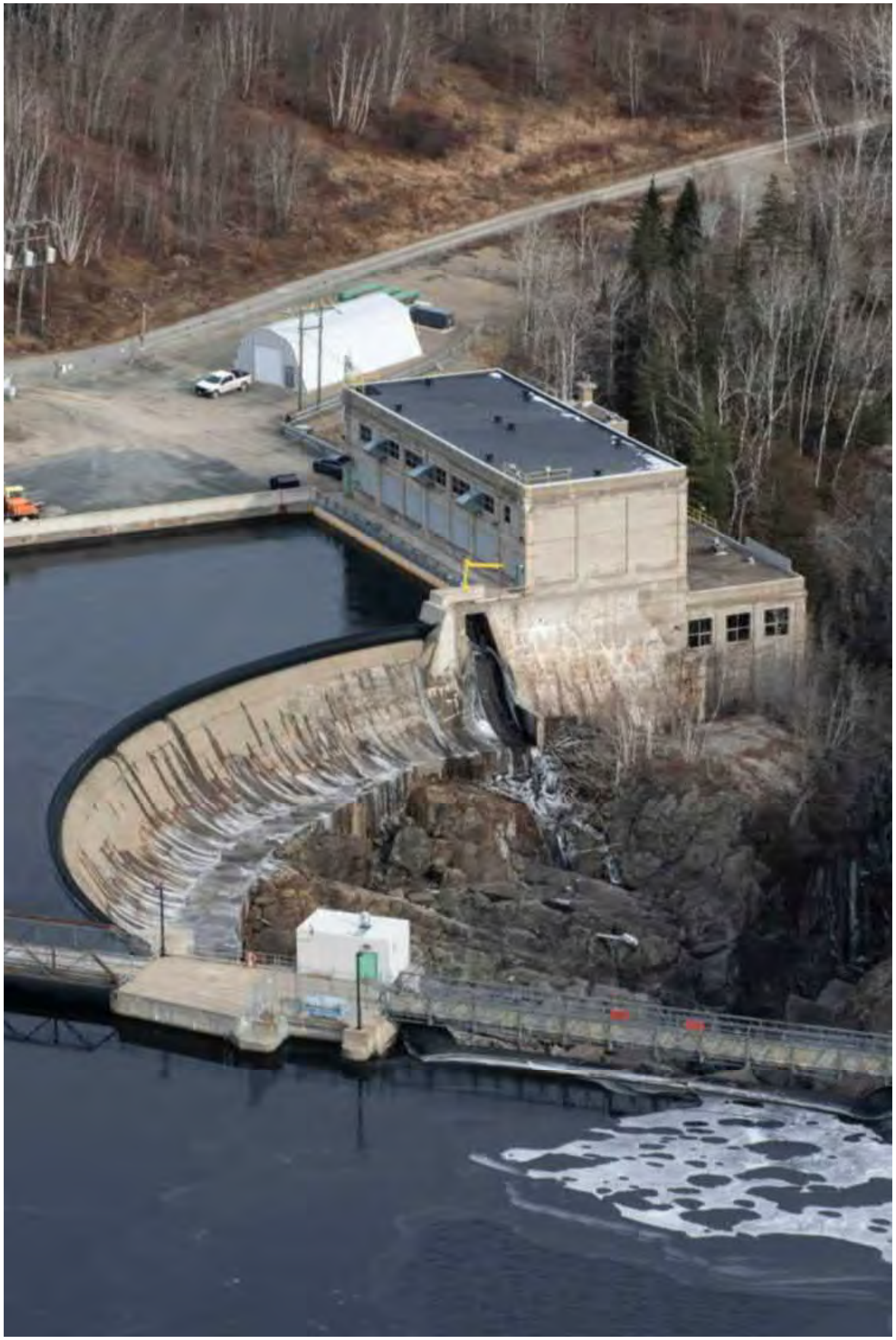
Merci pour votre intérêt.

Presentation from Virtual Public Open House,
July 20, 2021

WELCOME TO THE

Nepisiguit Falls Generating Station **LIFE EXTENSION PROJECT**

VIRTUAL OPEN HOUSE
July 20th, 2021



Énergie NB Power | the power of possibility
débordant d'énergie

HOUSEKEEPING

- This presentation will be recorded
  - the slides and recording will be posted on the Nepisiguit Project (nbpower.com) website
- You can ask questions as we go through the presentation
  - simply type into the question box and we will raise the questions during the Q&A
  - we will complete all presentations before answering questions
  - questions posted anonymously will not be answered
- We will answer the Project related questions submitted
  - if we are unable to answer the questions during this session, we will post the questions and answers on the Nepisiguit Project Website
- You may also submit questions following the presentation
  - please send them to the Project email: **NepisiguitProject@nbpower.com**

THE PRESENTERS

Wendi Wright, P.Eng.
Project Manager
NB Power

Matt Gorman, P.Eng.
Environmental Lead
NB Power

Jennica Doucet, EIT
Project Engineer
NB Power

Denis Marquis, P.Eng.
Project Manager
EIA Dillon Consulting

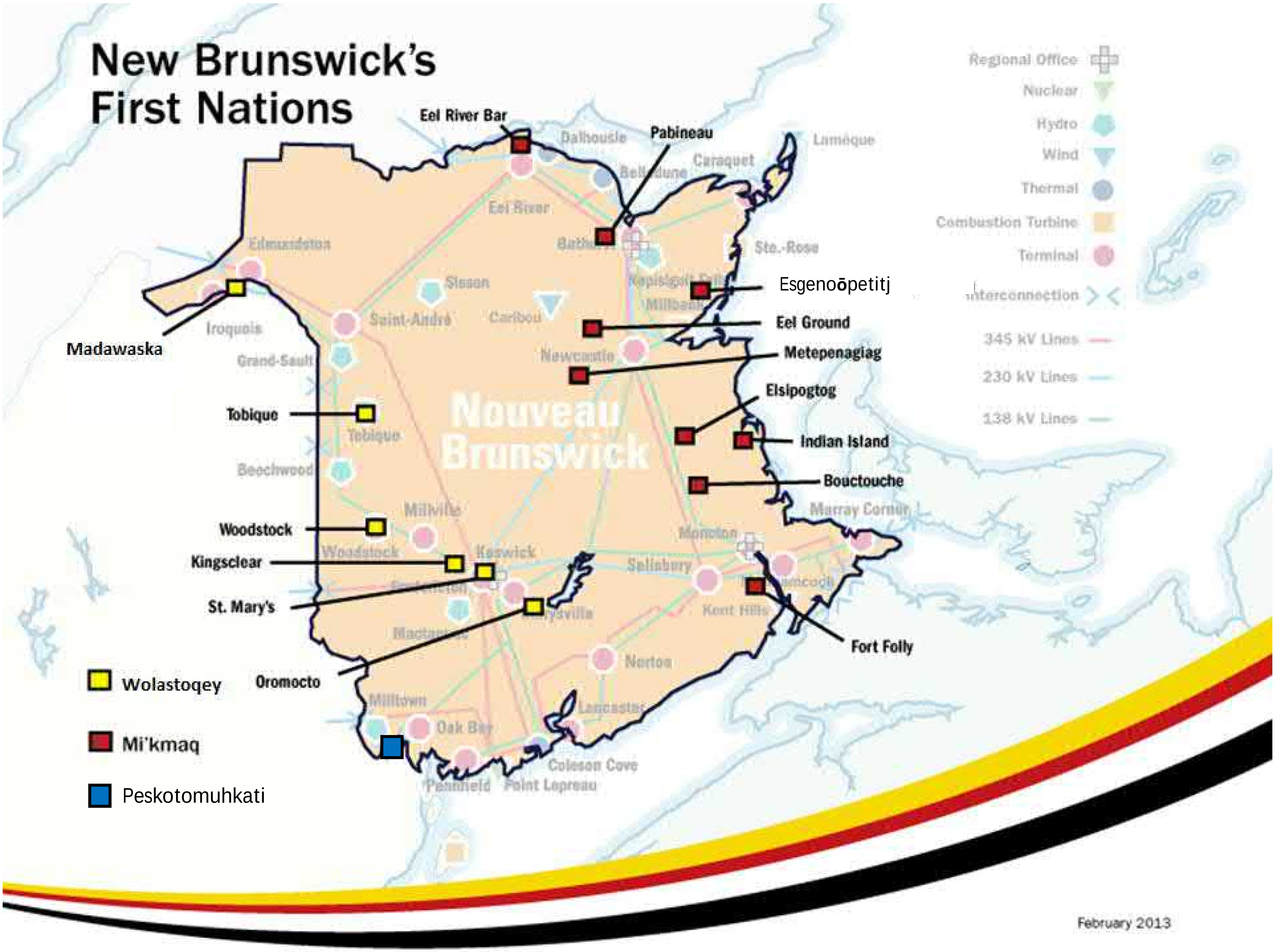
Brad Jones, P.Eng.
Project Manager
Wood Consulting

Énergie NB Power | the power of possibility
débordant d'énergie

New Brunswick Power (NB Power)

- Our roots trace back to the early 1880s
- NB Power serves more than 400,000 customers across New Brunswick
- Maintaining one of the most diverse generation fleets in North America
- Supplying our customers with 80% carbon-free electricity

Énergie NB Power | the power of possibility
débordant d'énergie



February 2013

First Nations History

- Nepisiguit River known as Oin-pe-gi-tjoig (meaning "roughly flowing"), and surrounding lands were first occupied by the Mi'kmaq people
- The river was used as a primary mode of transportation and means of sustenance since time immemorial by the Mi'kmaq peoples and specifically by what is now known as the Pabineau First Nation (Oinpegitjoig L'Noeigati)
- The historic Nepisiguit Mi'gmaq Trail is thousands of years old and was used to access tribal hunting, fishing, trapping, and gathering sites. The trail was also used as a thoroughfare, which the Mi'kmaq peoples traveled to trade with other First Nation communities

National Gallery of Canada, 1875

STATION HISTORY AND PROJECT OVERVIEW

Wendi Wright, P.Eng.
NB Power

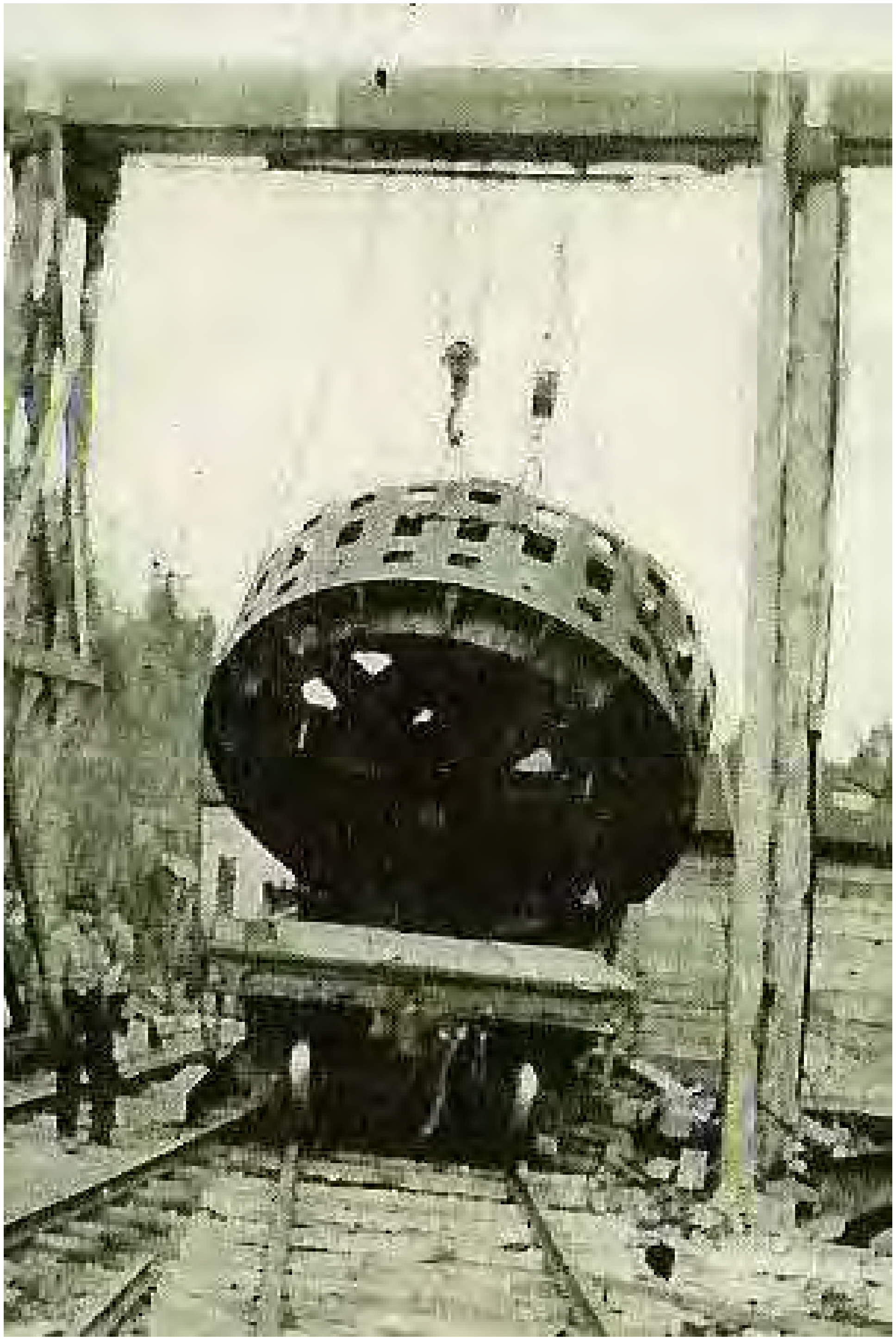
PROJECT WEBPAGE
nbpower.com/nepisiguitproject

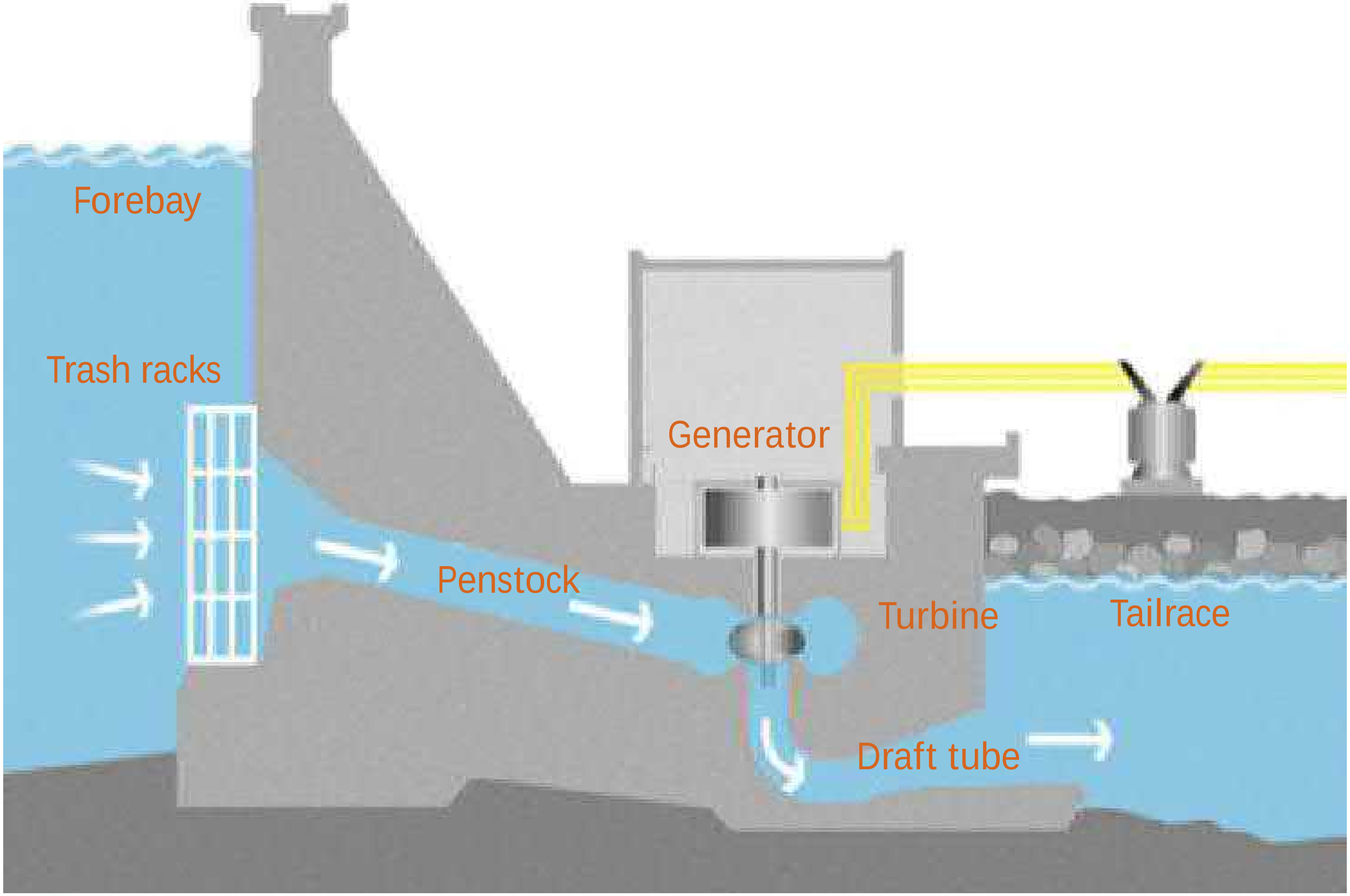
PROJECT EMAIL
nepisiguitproject@nbpower.com

Énergie NB Power | the power of possibility
débordant d'énergie

Nepisiguit Falls Generating Station History

- The Nepisiguit Falls Generating Station (NFGS), originally known as the Great Falls Generating Station, was commissioned in 1921
- A third unit was commissioned in 1929 increasing the capacity to 10.8 MW
- NB Power has been operating the NFGS since it was purchased in 2008
- NB Power changed the station's name from Great Falls Generating Station to Nepisiguit Falls Generating Station





Énergie NB Power | the power of possibility
débordant d'énergie

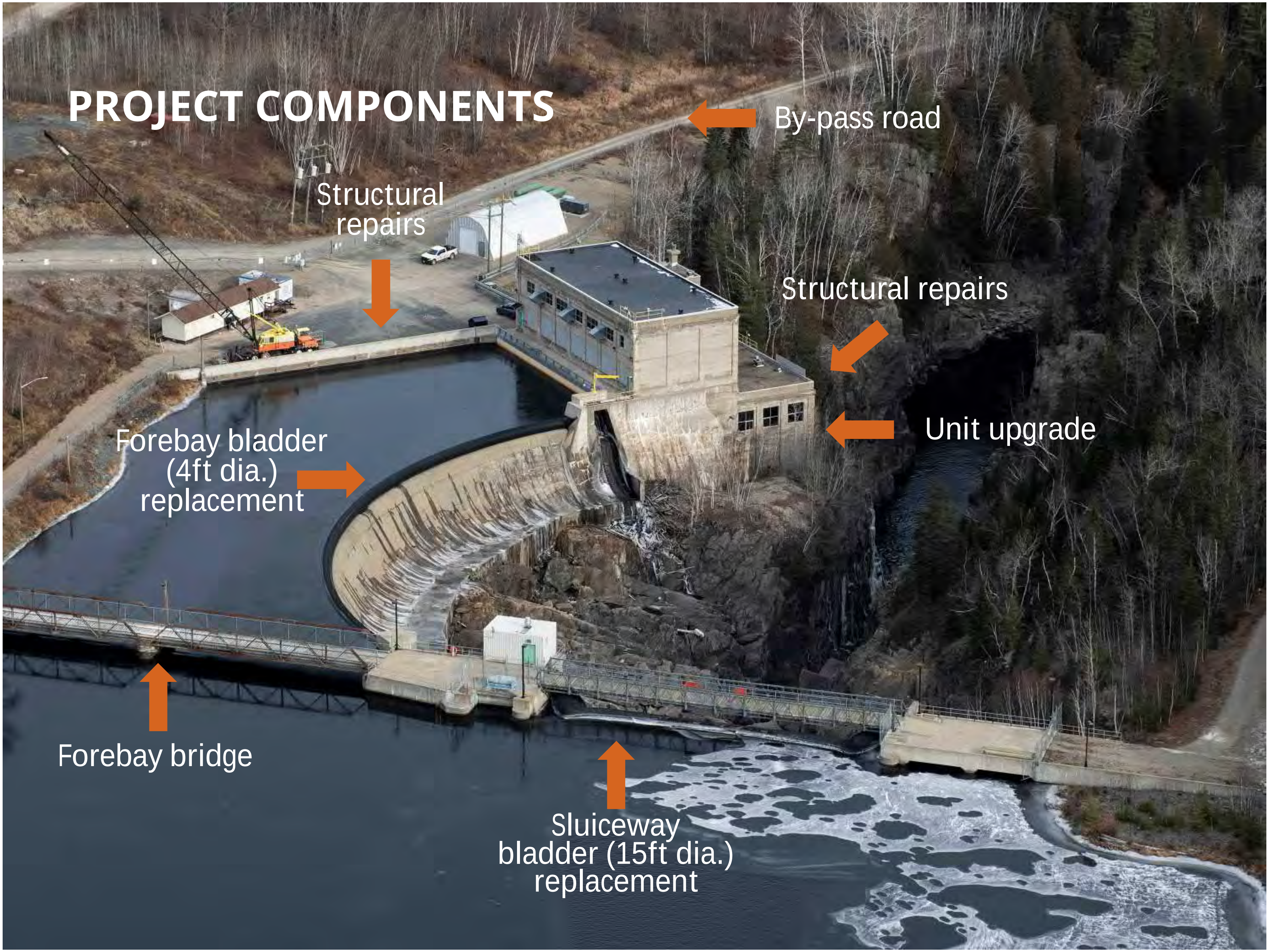
NFGS History

- The generators were recently derated due to aging concerns. The station now has a capacity of approximately 10.2 MW

- NFGS is in need of refurbishment to extend its life for another 50 years

- Since 2008 NB Power has:
    - Repaired the sluiceway
    - Installed trash racks
    - Installed the forebay bladder
    - Installed an emergency generator
    - Replaced electrical gear
    - And more

- NB Power will proceed through the permitting process to extend life of the station by completing additional upgrades


PROJECT COMPONENTS
By-pass road
Structural repairs
Structural repairs
Unit upgrade
Forebay bladder (4ft dia.) replacement
Forebay bridge
Sluiceway bladder (15ft dia.) replacement

Proposed project schedule for Life Extension Project

2021	• First Nations Consultation and Public Engagement (ongoing) • Unit replacement and bridge refurbishment detailed design • Start of long lead item tendering & manufacturing • EIA registration for NFGS Life Extension Project • By-pass road execution
2022	• Long lead item manufacturing and planned delivery • EIA process and issuance of certificate of determination (COD) (assumed) • Complete environmental permitting • Unit 1 Replacement and Bridge Refurbishment execution
2023	• Sluiceway Bladder Replacement, installation and removal of cofferdam
2024	• Unit 2 and 3 Replacement
2025	• Structural Repairs
>2030	• Forebay Bladder Replacement, installation and removal of cofferdam • Structural Repairs

ENGINEERING DESIGN OBJECTIVES

Bradley D. Jones, P.Eng.
Wood Canada Limited

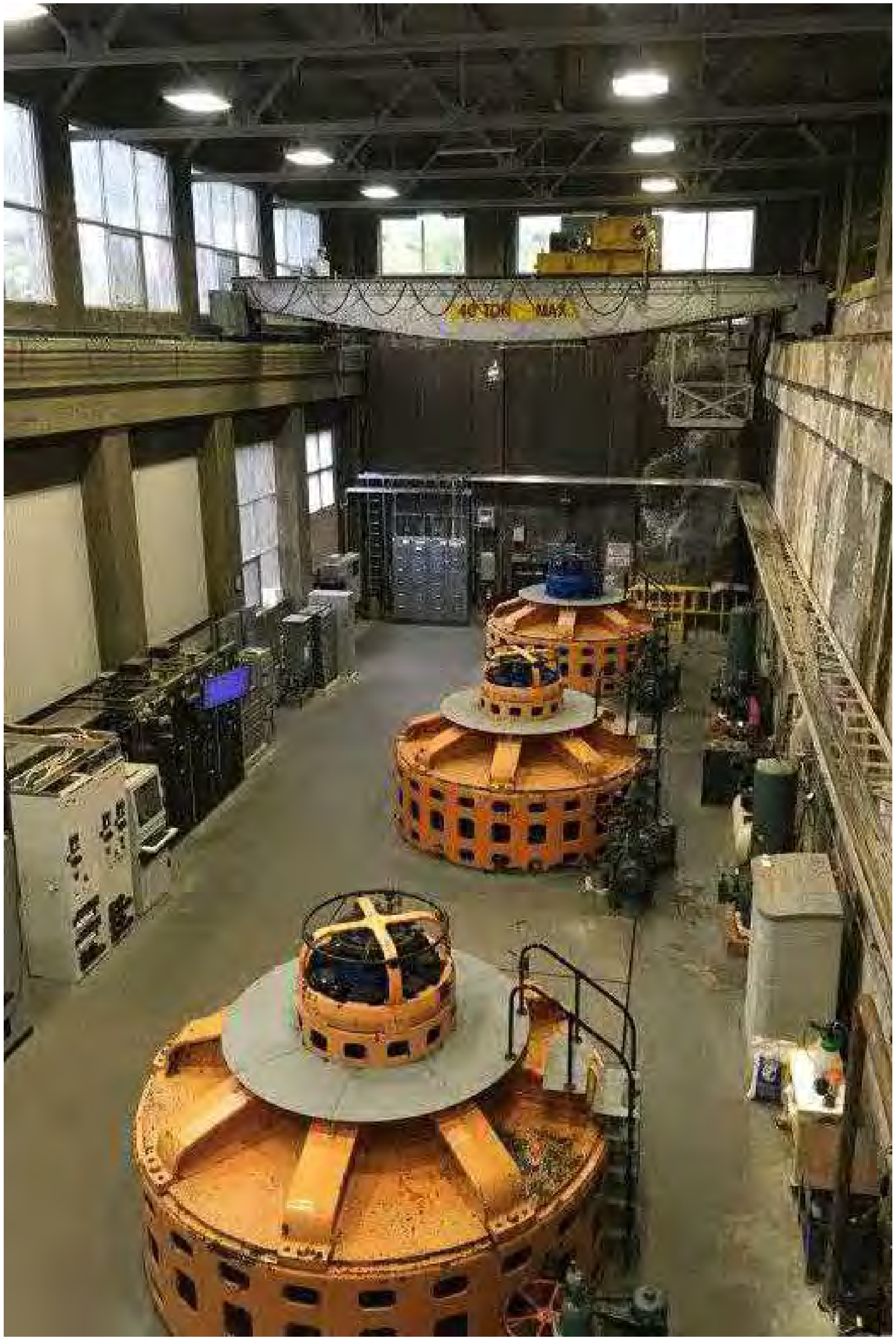
PROJECT WEBPAGE
nbpower.com/nepisiguitproject

PROJECT EMAIL
nepisiguitproject@nbpower.com

Énergie NB Power | the power of possibility
débordant d'énergie

Unit Replacement

- Replace current Francis Turbines with DIVE Turbines and generator Units
- Upgrade balance of plant equipment
- Upgrade control system to run remotely
- Extending life of penstock
- Majority of work occurring in the powerhouse and gate house with the exception of laydown areas loading and unloading equipment



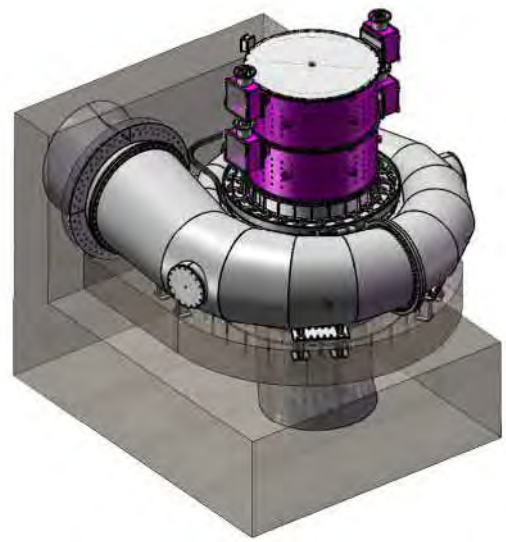
Énergie NB Power | the power of possibility
débordant d'énergie

Unit Replacement – Quick Facts

CURRENT

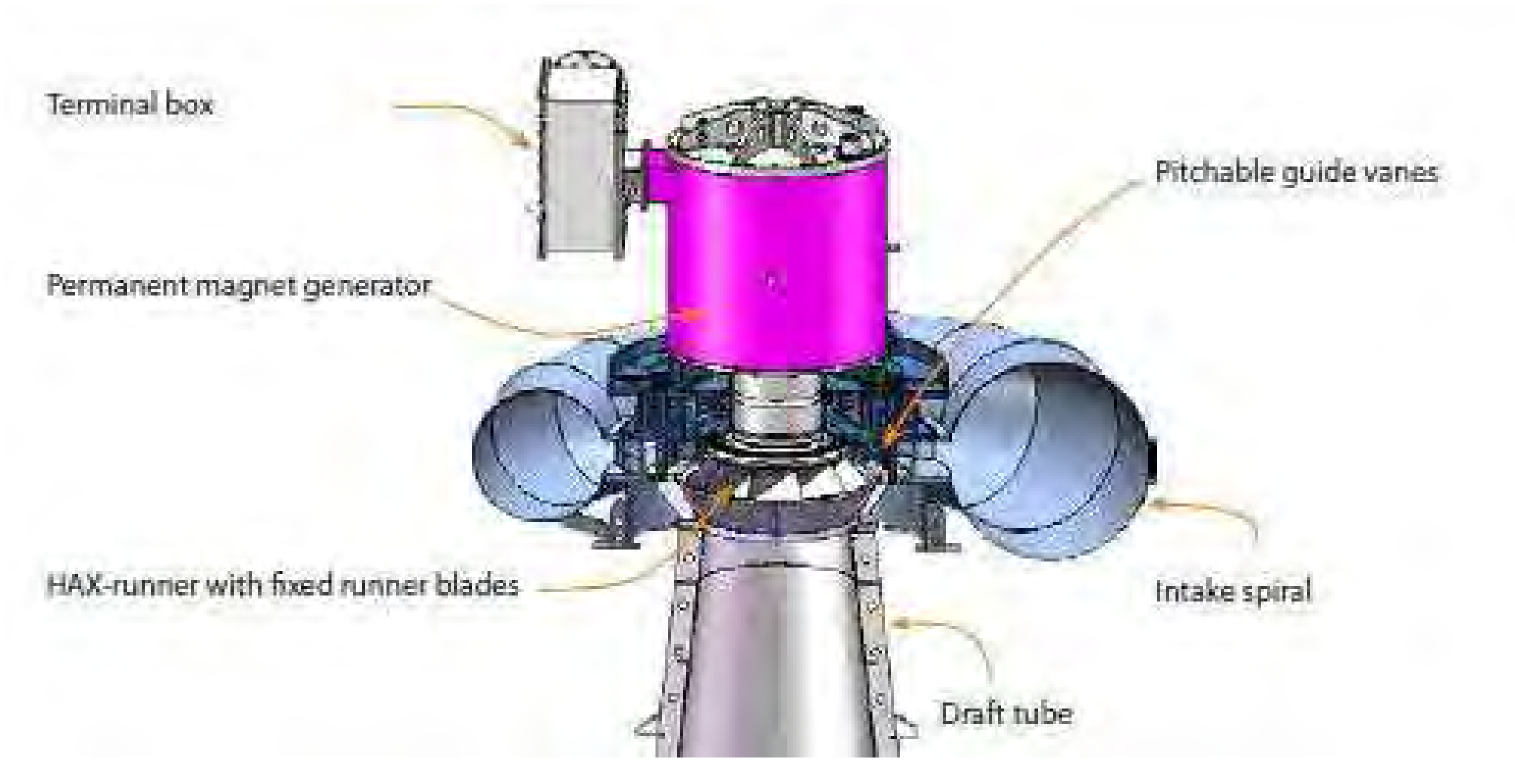
- Total derated nameplate: 10.2 MW
- Average annual generation: 50 GWh
- Manned 24/7
- Shutdown during flood conditions

PROPOSED

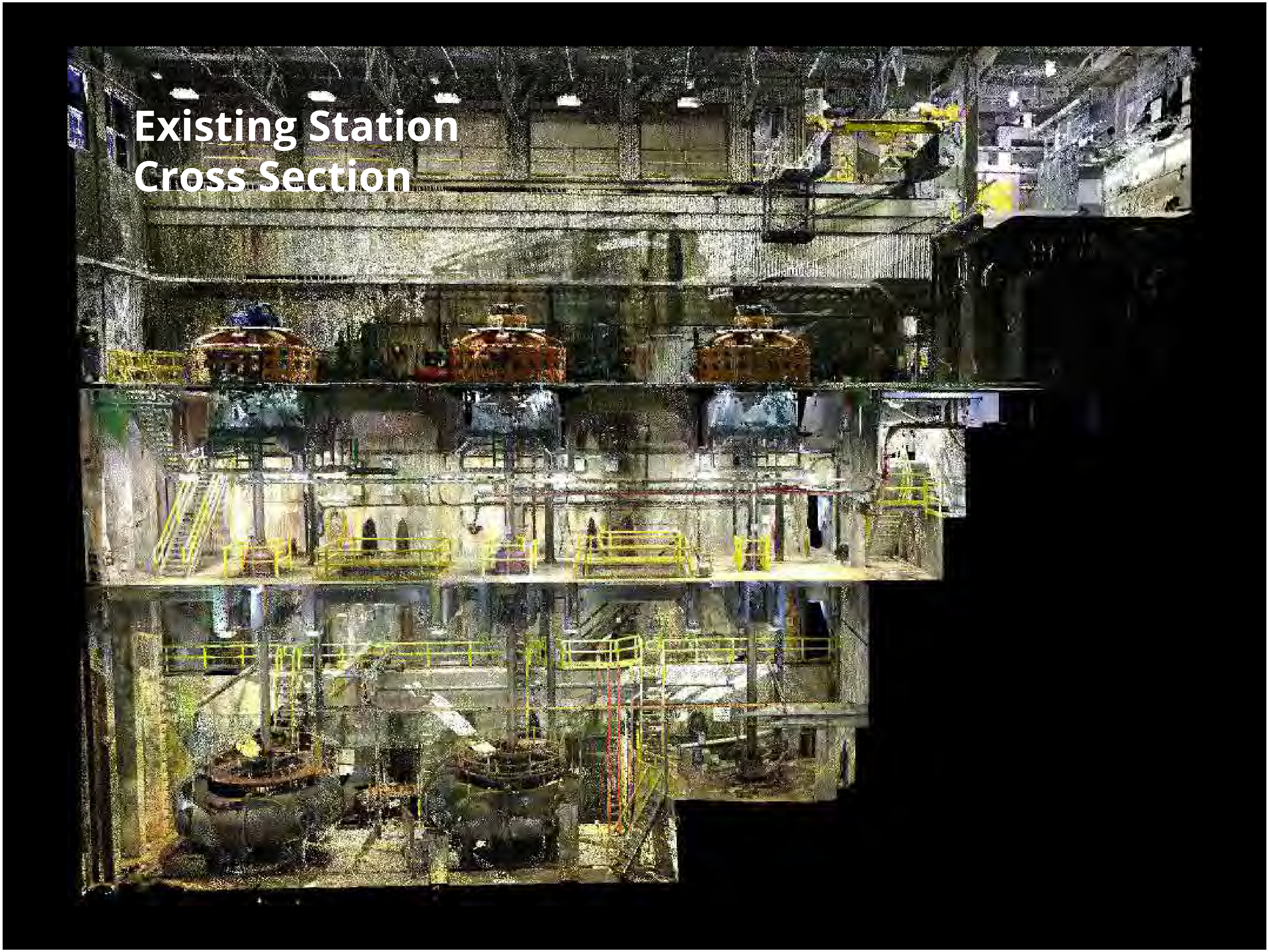


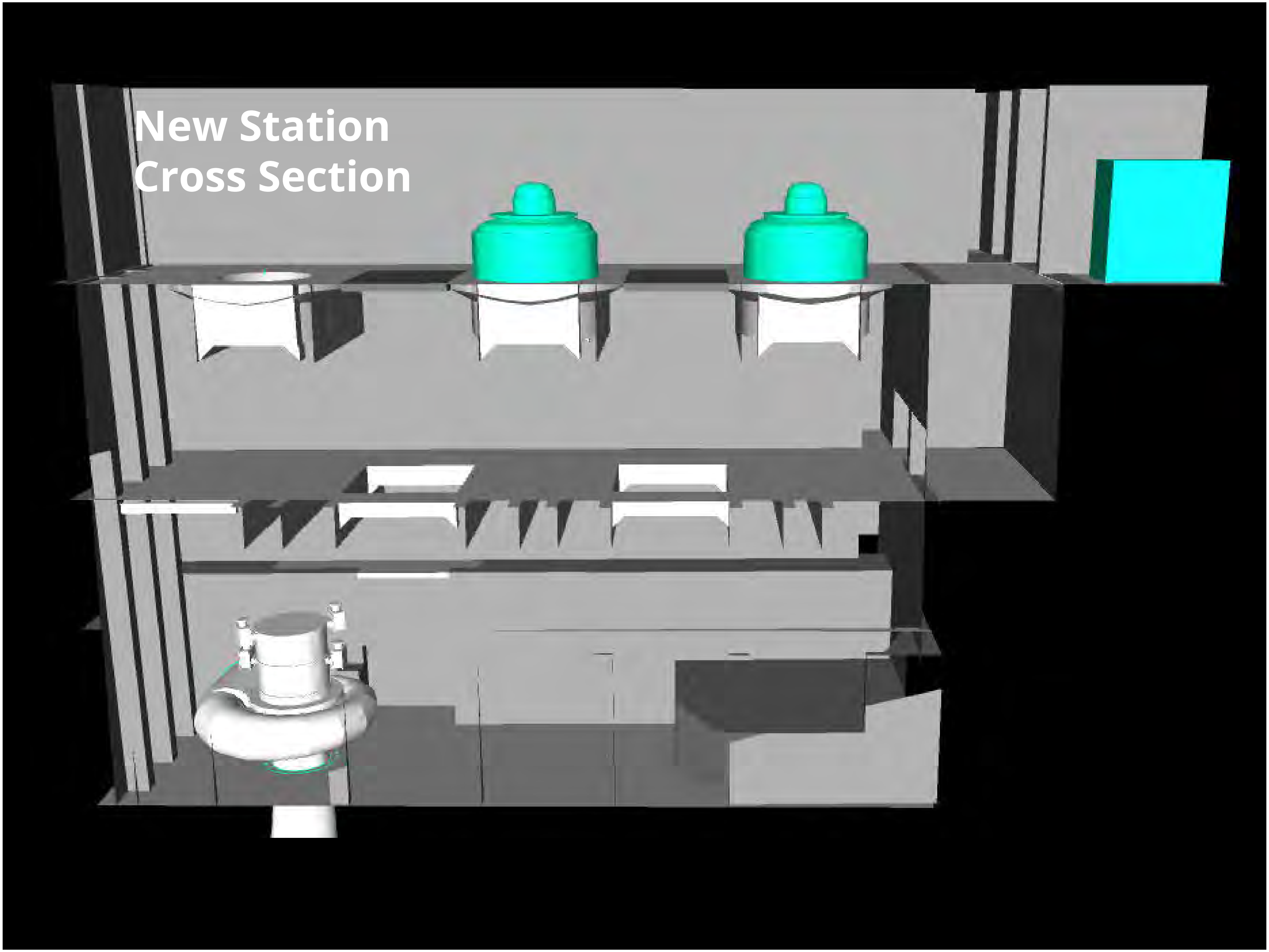
- Total nameplate 13.2 MW
- Expected annual generation: 70 GWh
- Remotely operated station
- Operational during flood conditions

About Dive HAX



Dive HAX is a double regulated half-axial (HAX) turbine
for medium head applications


Existing Station
Cross Section


New Station
Cross Section

ENGINEERING DESIGN OBJECTIVES

Jennica Doucet, EIT

PROJECT WEBPAGE
nbpower.com/nepisiguitproject

PROJECT EMAIL
nepisiguitproject@nbpower.com

Énergie NB Power | the power of possibility
débordant d'énergie

Forebay Bridge Refurbishment

- It is believed the forebay bridge is original and was built around 1921
- The bridge was closed for unessential travel due to structural concerns in 2020
- This bridge is used to access the bladder control building located between both bridges and for annual maintenance of station components
- NB Power is evaluating the options of repairing the bridge or replacing the bridge with a single span Bailey bridge

Énergie NB Power | the power of possibility débordant d'énergie

Sluiceway Bladder Replacement (15ft dia.)

- The Sluiceway Bladder was installed in 1999 by previous owner
- The Sluiceway Bladder is used as the main spill way
- Testing in 2020 indicated bladder required to be replaced by the summer of 2024
- This bladder has a 15ft diameter and is 101ft long.
- Cofferdam is required for replacement
- Further public communications will be conducted at a future date

Forebay Bladder Replacement (4ft dia.)

- The Forebay Bladder was installed in 2012 by NB Power
- The Forebay Bladder was installed to increase the forebay levels
- Testing in 2020 indicated bladder is in good condition. Forebay bladder replacement is not expected before 2030
- Cofferdam is required for replacement
- Further public communications will be conducted at a future date

Énergie NB Power | the power of possibility / débordant d'énergie

Structural Concrete Repairs

- NFGS concrete structure is over 100 years old
- All water retaining concrete experiences degradation due to many reasons such as erosion
- Station structure is in relatively good condition for its age and is structurally sound
- Structure has had multiple structural repairs over the years as part of a repair program
- Repairs are to prevent further damage and not currently seen as a safety concern

EIA AND ENVIRONMENTAL PERMITTING

Denis Marquis, P. Eng.
Dillon Consulting

PROJECT WEBPAGE
nbpower.com/nepisiguitproject

PROJECT EMAIL
nepisiguitproject@nbpower.com

Énergie NB Power | the power of possibility
débordant d'énergie

Environmental Impact Assessment and Permitting

- Each of the Project components may require an environmental impact assessment (EIA) registration, at minimum, under the New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act*
    - Item (b) "*all electric power generating facilities with a production rating of three megawatts or more*"
- While some of the Project components could be considered to be routine maintenance activities, NB Power's proposed approach is to register all Project components in a single EIA registration document
    - Transparent, holistic approach
- Various federal and provincial permits are also required following the EIA decision
    - Permit under the NB *Watercourse and Wetland Alteration Regulation*
    - Licence of Occupation under the NB *Crown Lands and Forests Act*
    - Permit under the federal *Canadian Navigation Protection Act*
    - Permit under *the federal Fisheries Act*
    - Potentially others (?)

New Brunswick EIA process at a glance

1. Submission of EIA registration document

2. Review by Technical Review Committee (TRC)

- Iterative question and answer process;
- Public, stakeholder and Indigenous engagement; and
- Recommendation to Minister of the Environment and Climate Change.

3. Minister

- Approves EIA with conditions (determination review); or,
- Determines that a more detailed EIA is required (comprehensive review).

4. Following EIA decision, various approvals and permits are obtained

Timelines: Determination review = 6 to 12 months
(approx.) Comprehensive review = 24 to 36 months (typical).

Key considerations for the EIA

- LOCATION, LOCATION, LOCATION

  Located on the Nepisiguit River (with known Atlantic salmon and American eel populations) at the top of a natural waterfall (a natural barrier to fish passage)

- HISTORIC FEATURES

  Though the Station does not have an official heritage designation locally, provincially, or nationally, it consists of a 100 year-old structure with unique character that could be valued from a historic perspective

- CHANGES IN WATER LEVELS

  Temporary changes in water elevations in the impoundment are expected during partial dewatering to accomplish Project activities. Water levels will be returned to normal operating levels once the cofferdams are removed and activities are complete

- POTENTIAL RELEASE OF SEDIMENT

  Potential for water quality concerns from release of sediment during partial dewatering of the impoundment

Key considerations for the EIA

- PROJECT SEQUENCING
  Work around major fish migration periods to avoid impacts to fish populations;

- MI'KMAQ TRADITIONAL TERRITORY
  The river itself, and the surrounding land on both sides of the river, is an integral part of the Mi'kmaq traditional territory and is used for traditional activities such as hunting, fishing, trapping, and gathering (especially by the nearby Pabineau First Nation)

- ARCHAEOLOGICAL POTENTIAL
  Navigable watercourses and land adjacent to them have high archaeological potential ("highways of the past"). The Station's location on the Nepisiguit river (in the heart of Mi'kmaq traditional territory), along with a natural waterfall (where fish gathering at its base often make them prime fishing sites), result in a high potential to contain archaeological or cultural sites

Approach to the EIA and Permitting for the Project

Single EIA registration to cover all Project components

- "Phased" approach
- Registering all projects at once enables a holistic view of the environmental impacts and considers cumulative impacts of Project components

EIA registration document is based on desktop-level information only

- Confirmatory field studies to be conducted to verify the EIA predictions and provide site-specific data before disturbance

Confirmatory field studies and permit applications conducted the year before the Project component is to be carried out

- i.e., conduct field work and permit applications in 2022 for Project components that will be conducted in 2023, field work in 2024 for activities to be carried out in 2025, etc.
- Supplemental reports for each year of field study to be submitted to the TRC for review, despite EIA being complete
- Keeps the data "fresh" and provides a timely and focused site-specific characterization in support of permit applications

Public and Indigenous engagement throughout the Project

- Greater emphasis during EIA review period, with annual updates provided

Anticipated Schedule for EIA Registration

Summer 2021:	Prepare desktop EIA registration, conduct field studies
Fall 2021:	Submit EIA registration document to NB Department of Environment and Local Government
Fall 2021-Spring 2022:	Technical Review of EIA registration, public and Indigenous consultation ongoing
Spring-Summer 2022:	EIA decision (assumed)

CLOSING REMARKS

Wendi Wright, P.Eng.
NB Power

PROJECT WEBPAGE
nbpower.com/nepisiguitproject

PROJECT EMAIL
nepisiguitproject@nbpower.com

Énergie NB Power | the power of possibility
débordant d'énergie


Execution Strategy – Life Extension Project
Delivery route
Laydown area
Delivery route
Bridge closure until 2022
Bridge closure 2023
Powerhouse
Tailrace Road

Benefits of NFGS

Current benefits of NFGS:

- NFGS is located on a natural fish barrier. No fish ladder is required
- NFGS can be used as a peak load station to take advantage of time of day production

Benefits of NFGS Life Extension Project:

- Provide approximately 10,000 New Brunswick households with green energy
- Construction Jobs (estimated peak)
  - Unit Upgrade: 30 jobs
  - Bridge Refurbishment: 10 jobs
  - Bladder replacements: 15 jobs

Énergie NB Power | the power of possibility débordant d'énergie

CONTACT US

nepisiguitproject@nbpower.com

PROJECT WEBPAGE

nbpower.com/nepisiguitproject

Énergie NB Power | the power of possibility
débordant d'énergie

THE PRESENTERS

Wendi Wright, P.Eng.
Project Manager
NB Power

Matt Gorman, P.Eng.
Environmental Lead
NB Power

Jennica Doucet, EIT
Project Engineer
NB Power

Denis Marquis, P.Eng.
Project Manager
EIA Dillon Consulting

Brad Jones, P.Eng.
Project Manager
Wood Consulting

Énergie NB Power | the power of possibility
débordant d'énergie

THIS CONCLUDES THE

Nepisiguit Falls Generating Station **LIFE EXTENSION PROJECT**

VIRTUAL OPEN HOUSE

Thank you for participating

Énergie NB Power | the power of possibility
débordant d'énergie

Question and Answer Document
from Virtual Public Open House,
July 20, 2021

Virtual Open House
Q & A Document

Nepisiguit Falls Generating Station
Life Extension Project

Énergie NB Power | the power of possibility
débordant d'énergie

LA CENTRALE DE

NEPISIGUIT FALLS

GENERATING STATION

The following is a summary of the questions received during the Nepisiguit Falls Generating Station Life Extension Project virtual open house held on July 20, 2021 and corresponding responses.

GENERAL PROJECT

1. Why not simply decommission the Station?

This is a long-term investment for New Brunswickers to have clean, reliable energy at competitive prices. Nepisiguit is located at a natural barrier (waterfall) therefore fish migration through the dam is not a concern. Nepisiguit's structure is in good shape. With these upgrades and replacements, the station will be able to produce 13.2 MW to serve the next generation of New Brunswickers needs.

2. How many customers currently rely on the station?

Currently Nepisiguit produces enough energy to power approximately 8,000 homes. With the upgrade the number will be increased to approximately 10,000 homes.

3. What is the estimated cost of this project?

The estimated cost of the project is between 20 and 25 million. This includes the Forebay Bridge Refurbishment, the Sluiceway Bladder and Unit 1 Replacement. This estimate does not include Units 2 and 3, structural repairs or the Forebay Bladder Replacement.

4. How long is the bypass road?

NB Power is examining two options when it comes to addressing the current situation with the bypass road. One option is to build a new road which would be approximately 250 m long. The other option is to repair an existing woods road for public use. The second option would be longer and only involve vegetation management work.

5. Will the project be tendered out in phases and when approximately will tenders start going out?

The project will be tendered out in phases. Material and equipment are expected to be tendered the year before construction unless the lead time is longer. Material and equipment contracts are expected to go out as early as fall 2021. It is expected that installation contracts will be bid in the winter of 2022, the year before execution. All contracts will be tendered under the Crown Construction Contracts Act or the Procurement Act unless using pre-existing agreements i.e., NMA.

6. Will the replacements of units 1, 2 and 3 be performed under NB Powers NMA agreements, or will this work be done through public tenders?

Yes, the major electrical work and major mechanical work will be completed under NB Powers NMA agreements. Nepisiguit's current NMA agreement expires December 31, 2021 and the new bid is expected to go out in the fall of 2021.

7. How many people are currently employed at the station?

We currently have seven employees at the station: five operators, one supervisor and one labourer.

8. Is this open house a consultation or a presentation?

This open house is part of the consultative process that we do with the members of the public, stakeholders, right holders and landowners to make sure that they are aware of the project details and have the opportunity to ask questions and raise any concerns. An in person open house was held with Pabineau First Nations on July 22, 2021 which is also part of this consultation and engagement.

9. Have the people of Papineau First Nation been consulted specifically regarding this project?

The project team began communications with MTI (Mi'gmawe'l Tplu'taqnn Inc) in July and August 2020. MTI is the consultative body for all the Mi'gmawe'l First Nations in the province of New Brunswick. The Project Team went to Pabineau First Nations in June of 2021 and had a meeting with the Chief and his counselors on this project. On July 22, 2021 the project team met with the Pabineau First Nations community for an in person open house. First Nation Monitors from MTI have been invited to all environmental surveys and have participated to the extent possible. Pabineau First Nations was also invited to take part in the July 2021 environmental studies relating to the project work. Communication with both MTI and Pabineau First Nations will be ongoing through out the Project..

10. Can you talk a bit about how this project accounts for the recent fiscal results NB Power posted? What measures are you taking throughout the project to help improve NB Power's fiscal situation?

The Nepisiguit Life Extension Project would have had no impact on NB Powers Fiscal Year 2020 statistics.

ENGINEERING

11. What is causing damage to the bladders? Just environmental degradation?

There are a number of factors that can cause degradation to these bladders. Two (2) of the major ones would be the contraction and expansion which is necessary to spill water, and the other being the bladders exposure to the sun.

Overtime this degradation effects the materials elasticity, tensile strength and other physical property of the bladder. These bladders are similar to tires on a car in that as they degrade more and more, it is more likely that damage will occur to it. These bladders could be damaged by rubbing against concrete or being impacted by items such as ice or trees. However, if we keep within the range of the recommendations for the elasticity, tensile strength and a couple of other physical properties and parameters, damage would be less likely for these bladders.

12. Will the scroll cases be replaced or is it part of the penstock refurbishment?

The scroll cases will be replaced as part of the Unit Replacement Project. As part of our fluid dynamics analysis for the operating of the new units it will require a change to the scroll case to optimize the flows for the new turbines and runners.

13. According to your predictions, what will be the duration of the temporary drainage and water quality problems in the basin?

The cofferdam for the 15ft bladder replacement is expected to be in place for no longer then 6 months. This means that the area would be dewatered for no more than six months as well. During the unit replacements we would also dewater our units. However, dewatering these units occurs on a regular basis and is done in a way that there is no impact of the upstream or downstream flow.

The nature of these activities is such that the main concern would be the release of sediment and suspended solids from the construction activities of the cofferdam. Mitigation will be in place in the form of erosion and sedimentation controls and various other mechanisms to prevent releases.

There is no project activity that we expect would change water quality in the river. There are no chemicals being used, there are no transformation processes. We are basically playing in the dirt by building cofferdams. We may generate some suspended solids that we will have to carefully manage through erosion and sedimentation controls.

Water quality sampling was done to establish a baseline when we collected the fish and fish habitat information in July 2021. We are awaiting those results from the laboratory.

ENVIRONMENTAL IMPACT ASSESSMENT AND PERMITTING PROCESS

14. What are the ecological impacts of the bypass road? Will this be considered during the EIA?

The bypass road itself will proceed outside of the EIA. It is important to have the road in place, it needs to be constructed before the other activities can take place.

The trigger under the EIA Regulation for roads is 5 km or more, so there is no requirement to have the bypass road as part of the EIA as it is shorter than 5 km.

To come through any undisturbed land has some implications. We must understand what vegetation will be removed, what birds are using this area as well as any other flora and fauna that might be present. We've done all those surveys already. There are no species at risk that have been identified in the area of the bypass road. Therefore, those construction activities can take place just with normal good housekeeping construction practices.

Due to safety concerns, we ask the member of the public that use the trail system to avoid the project site whenever heavy equipment is in use and lay down areas are being used.

15. With this life extension project extending over several years, will the approval process happen in stages?

That is correct. The EIA takes place up front this year for all the project components. However, the permits will be applied for and approved the year before the activity takes place. For example, for any project activity that takes place in 2024 we would go back and do the field work for that activity and apply for the permits in 2023. Completing the field work and permitting a year before the activity makes sure that we remain within the regulatory framework. The regulatory framework changes overtime. For example, there were changes to the Fisheries Act in 2019 and there is no guaranteeing that change will not occur again.