5.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS ON THE ATMOSPHERIC ENVIRONMENT

The atmospheric environment valued component (VC) includes consideration of potential environmental effects on air quality, greenhouse gases, and the acoustic environment. These components constitute a VC due to:

- emissions to the atmosphere from the Project which may present a pathway for humans and biota to be exposed to air contaminants;
- provisions regarding air contaminant and noise emissions under the New Brunswick *Clean Air Act* and *Air Quality Regulation*;
- releases of greenhouse gases (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;
- the Health Canada guidelines are provided for noise and the potential related environmental effects on community health.

Further, the atmosphere functions as a pathway for the transport of air contaminants and sound to the freshwater, marine, terrestrial, and human environments.

5.1 REGULATORY AND POLICY SETTING

5.1.1 Air Quality

Air quality in New Brunswick is regulated by the *Air Quality Regulation* under the New Brunswick *Clean Air Act*. The regulation and act provide measures to regulate the release of air contaminants to the atmosphere from “sources”, provide testing and monitoring provisions, and establish maximum permissible ground-level concentrations of specified air contaminants in ambient air, among other requirements.

Applicable federal air quality criteria considered in the assessment were the National Ambient Air Quality Objectives (NAAQOs), Canada Wide Standards (CWSs), and the Canadian Ambient Air Quality Standards (CAAQS). The NAAQOs were established by the federal government in the early 1970s to protect human health and the environment by setting objectives for the following common air pollutants, among others: carbon monoxide, nitrogen dioxide, ozone, sulphur dioxide and total suspended particulates. The objectives are denoted as “Desirable”, “Acceptable” and “Tolerable” ranges for ground-level concentrations of air contaminants.

The CWSs are based on intergovernmental agreements developed under the Canadian Council of Ministers of the Environment (CCME) Canada-wide Environmental Standards Sub-Agreement, which operates under the broader CCME Canada-wide Accord on Environmental Harmonization. The CWSs are intended to address key environmental protection and health risk issues that require concerted action across Canada. The CWSs represent cooperation toward a common goal, but confer no specific authority to any federal, provincial, or territorial government.

The CAAQS for $PM_{2.5}$ and ozone were developed through a collaborative process involving the federal, provincial and territorial governments and stakeholders, as directed by the CCME (CCME 2012). The CAAQS have replaced the CWSs for $PM_{2.5}$ and ozone. CAAQS for $PM_{2.5}$ and ozone have been developed for years 2015 and 2020 as shown in Table 5.1 below. On October 3, 2016, the CCME announced a new CAAQS for SO_2 with effective dates of 2020 and 2025. These values are also shown in Table 5.1.

The New Brunswick Air Quality Objectives (NBDELG 2017) apply to ambient air and were established under the *Clean Air Act* in 1997. These values are also shown in Table 5.1.

Table 5.1 Summary of Federal NAAQOs, CWSs, and CAAQSs; and Provincial New Brunswick Air Quality Objectives

Contaminant and Units (alternative units in brackets)	Averaging Time Period	Canada Wide Standards (CWSs)	Canadian Ambient Air Quality Standards (CAAQSs)	National Ambient Air Quality Objectives (NAAQOs)			New Brunswick Air Quality Objectives
				Maximum Desirable	Maximum Acceptable	Maximum Tolerable	
Sulphur dioxide*, $\mu g/m^3$	1 hour	-	200[D] 186[E]	450	900	-	900
	24 hour	-	-	150	300	800	300
	Annual	-	14.3[D] 11.4[E]	30	60	-	60
Nitrogen dioxide, $\mu g/m^3$	1 hour	-	-	-	400	1,000	400
	24 hour	-	-	-	200	300	200
	Annual	-	-	60	100	-	100
Carbon monoxide, mg/m^3	1 hour	-	-	15	35	-	35
	8 hour	-	-	6	15	20	15
Total Particulate Matter (PM), $\mu g/m^3$	24 hour	-	-	-	120	400	120
	Annual	-	-	60	70	-	70
$PM_{2.5}$, $\mu g/m^3$	24 hour	30[A]	28[B] 27[C]	-	-	-	-
	Annual		10.0[B] 8.8[C]				-
Ozone (O_3), $\mu g/m^3$	1 hour	-	-	100	160	300	-
	8 hour	139[A]	135[B] 133[C]	-	-	-	-
	24 hour	-	-	30	50	-	-
	Annual	-	-	-	30	-	-
Hydrogen sulphide, $\mu g/m^3$	1 hour	-	-	-	-	-	15
	8 hour	-	-	-	-	-	5

NOTES:

* The objectives for sulphur dioxide are 50% lower in Saint John, Charlotte and Kings counties as compared to the rest of New Brunswick.

A CCME (2014), Canada-Wide Standards for Respirable Particulate Matter and Ozone. The Respirable Particulate Matter Objective is referenced to the 98th percentile over three consecutive years; the Ozone Objective is referenced to the on 4th highest 8-hour average annual value, averaged over three consecutive years.

B CCME (2012), CAAQS for $PM_{2.5}$ and ozone for 2015. The 24-hour standard is referenced to the 98th percentile over three consecutive years, and the annual standard is referenced to the 3-hear average of the annual average concentration. The Ozone Objective is referenced to the on 4th highest 8-hour average annual value, averaged over three consecutive years.

C CCME (2012), CAAQS for $PM_{2.5}$ and ozone for 2020. The 24-hour standard is referenced to the 98th percentile over three consecutive years, and the annual standard is referenced to the 3-hear average of the annual average concentration. The Ozone Objective is referenced to the on 4th highest 8-hour average annual value, averaged over three consecutive years.

D CCME (2016), CAAQS for SO_2 effective 2020. The 1-hour standard is referenced to the 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations. The annual standard is the arithmetic average of all 1-hour average SO_2 concentrations.

E CCME (2016), CAAQS for SO_2 effective 2025. The 1-hour standard is referenced to the 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations. The annual standard is the arithmetic average of all 1-hour average SO_2 concentrations.

5.1.2 Greenhouse Gases

Federally, industrial facilities that emit more than 50,000 tonnes (t) carbon dioxide equivalent (CO_2e) per year are required to quantify and report GHG emissions to Environment and Climate Change Canada (ECCC) (ECCC 2016a). This includes sources of GHG from stationary combustion, industrial processes, venting, flaring, fugitives, onsite transportation, waste, and wastewater sources. ECCC has proposed to lower the reporting threshold to 10,000 t CO_2e per year for the 2017 reporting year and beyond (ECCC 2016a).

There is no federal regulatory requirement to reduce GHGs from a particular industrial facility or sector. The federal government, however, has indicated it will implement federal legislation that will mandate a national carbon pricing program by 2018, if individual provinces do not do so by then (ECCC 2016b). Such a program may impose a carbon tax on fossil fuel use, establish a cap-and-trade mechanism, or other means acceptable to ECCC. Any province that does not set its own carbon price will be mandated to use the federal government's minimum floor price. The Province of New Brunswick has announced its own approach to meeting the federal carbon pricing requirements with the intention of implementing a carbon levy that will be drawn from existing gasoline and diesel taxes currently in place and redirect them to a climate change fund to be reinvested in emission reduction initiatives.

In the Copenhagen Accord meeting in January 2010, the Government of Canada set a target of reducing GHG emissions by 17% by 2020 (compared with 2005 levels). Even longer term targets were set in May 2015, when Canada submitted its Intended Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (UNFCCC), in which a GHG emissions reduction target of 30% below 2005 levels by 2030 was announced. Since then, the federal government has signed and ratified the agreement put forward at the December 2015 Paris Climate Conference, in which countries around the world agreed to limit the global increase in atmospheric temperature to 1.5 °C above pre-industrial levels (ECCC 2016c).

The Pan-Canadian Framework (ECCC 2016b) is an effort by the provinces and territories to grow Canada's economy while also reducing emissions using the four following pillars:

- pricing carbon pollution;
- complementary actions to reduce emissions;
- adaptation and climate resilience; and
- innovation, support clean technology, and create jobs.

This Framework also acts as a commitment to meeting Canada's UNFCCC 2030 target of a 30% reduction below 2005 levels of GHG emissions.

For climate change and GHG emissions considerations in the context of environmental assessment, national guidance is provided by the Canadian Environmental Assessment Agency (CEA Agency, CEA Agency 2003) and includes guidance on the environmental assessment of GHG emissions from the Project and from the related industrial sector. In the guidance document it is suggested that, where emissions from a particular project are "medium" or "high", the preparation of a GHG Management Plan is required. Further regulation at the federal level is anticipated to occur in the future. The intentions are described in the Regulatory Framework for Air Emissions (Government of Canada [GOC] 2007), and Turning the Corner: Regulatory Framework for Industrial GHG Emission (GOC 2008).

New Brunswick does not yet have provincial legislation limiting emissions of GHGs. However, in 2017, the New Brunswick Department of Environment and Local Government (NBDELG) required industrial facilities that released more than 10,000 t CO_2e in the 2016 calendar year to report emissions to ECCC. New Brunswick has provincial GHG emissions reduction targets of 10% below 1990 levels by 2020, and 75-85% below 2001 levels by 2050. This was established in the province’s 2014-2020 Climate Change Action Plan (Province of New Brunswick 2014).

5.1.3 Acoustic Environment

There are no sound guideline levels, regulations, or standards currently established by the Province of New Brunswick for limiting acceptable sound levels from industrial facilities; however, Certificates of Approval issued under the *Clean Air Act* for an industrial facility are sometimes used to regulate noise. In such cases, the NBDELG generally requires that sound emissions from any activity be controlled so as not to cause substantial loss of enjoyment of the normal use of any property, or substantial interference with the normal conduct of business. Absolute limits are sometimes included in NBDELG’s approvals and typically range from 50 to 55 decibels on an A-weighted scale (dBA) (day) to 40 to 50 dBA (night). Some approvals specify a limit in reference to background levels, such as 3 dBA to 10 dBA above background levels (Glynn, M., pers. comm., 2012).

Health Canada has produced the document “Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise” (Health Canada 2016), which provides guidance on sound levels at the most exposed façade of a noise sensitive receptor for both construction and operation of sound emission sources. The recommended assessment method for long term construction (greater than 1 year), as well as operational noise, is to establish the baseline, construction, and operation day-night sound pressure levels (L_{DN}) and the percent of the population that is highly annoyed (% HA) by the increase in sound pressure levels. Sensitive receptors are residences, churches, nursing homes, schools, daycares, and hospitals.

5.2 POTENTIAL ENVIRONMENTAL EFFECTS, PATHWAYS, AND MEASURABLE PARAMETERS

Activities and components could potentially interact with the atmospheric environment to result in adverse environmental effects on air quality, increased levels of GHG emissions, and noise. In consideration of these potential interactions, the assessment of Project-related environmental effects on the atmospheric environment is therefore focused on the following potential environmental effects:

- change in air quality;
- change in GHG emissions; and
- change in acoustic environment.

The pathways and measurable parameters for the assessment of these environmental effects are provided in Table 5.2.

Table 5.2 Potential Environmental Effects, Environmental Effects Pathways, and Measurable Parameters for the Atmospheric Environment

Potential Environmental Effect	Environmental Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in air quality	• Changes to the quality of air arising from emissions from Project activities to the environment.	• Ground level concentrations of criteria air contaminants (CACs) in micrograms per cubic metre (µg/m^3), including sulphur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), total particulate matter (PM), and particulate matter less than 2.5 microns ($PM_{2.5}$).
Change in GHG emissions	• Emissions of GHGs to the environment due to Project activities.	• GHG emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Total GHG emissions in t CO_2e per year are determined using the mass of individual species and global warming potentials (GWPs) from IPCC Report 5 (IPCC 2013). These are 1, 25, and 298 for CO_2, CH_4, and N_2O, respectively.
Change in acoustic environment	• Changes to the existing acoustic environment arising from noise from Project activities to the environment.	• Sound pressure levels (L_{eq}, dBA). • Day-night average sound pressure level (L_{dn}, dBA). • Percent Highly Annoyed (%HA).

5.3 BOUNDARIES

5.3.1 Spatial Boundaries

The Project development area (PDA) is defined in Section 2.1 and is unchanged for the purposes of this assessment. The PDA includes footprint of two new submarine electrical cables, one from Deer Island to Campobello Island (through Head Harbour Passage) and one from Campobello Island to Grand Manan Island (through the Grand Manan Channel). It also includes the footprint of four land-based overhead-to-underground cable riser stations and associated landfall located at Deer Island (at Chocolate Cove), Campobello Island (at Wilsons Beach and Little Whale Cove), and Grand Manan Island (at Long Eddy Point), as well as the footprint of the two existing submarine electrical cables, to be decommissioned at some time in the future when they have reached the end of their service life.

The local assessment area (LAA) for each VC is the maximum area within which environmental effects from the Project activities and components can be predicted or measured with as reasonable degree of accuracy and confidence. The LAA can be thought of as the “zone of influence” of the Project on a particular VC, and thus can vary from one VC to the next. For considering a potential change in air quality and a change in GHG emissions, the LAA for the atmospheric environment generally extends from the edge of the PDA to 3 km in all directions. For considering a potential change in acoustic environment, the LAA for atmospheric environment generally extends from the edge of the PDA to 1 km in all directions. At a distance of 1 km from Project-related sources of sound emissions (heavy equipment, trucks), there is sufficient distance for the sound to naturally attenuate such that it would be (for the most part) not detectable over background sound pressure levels.

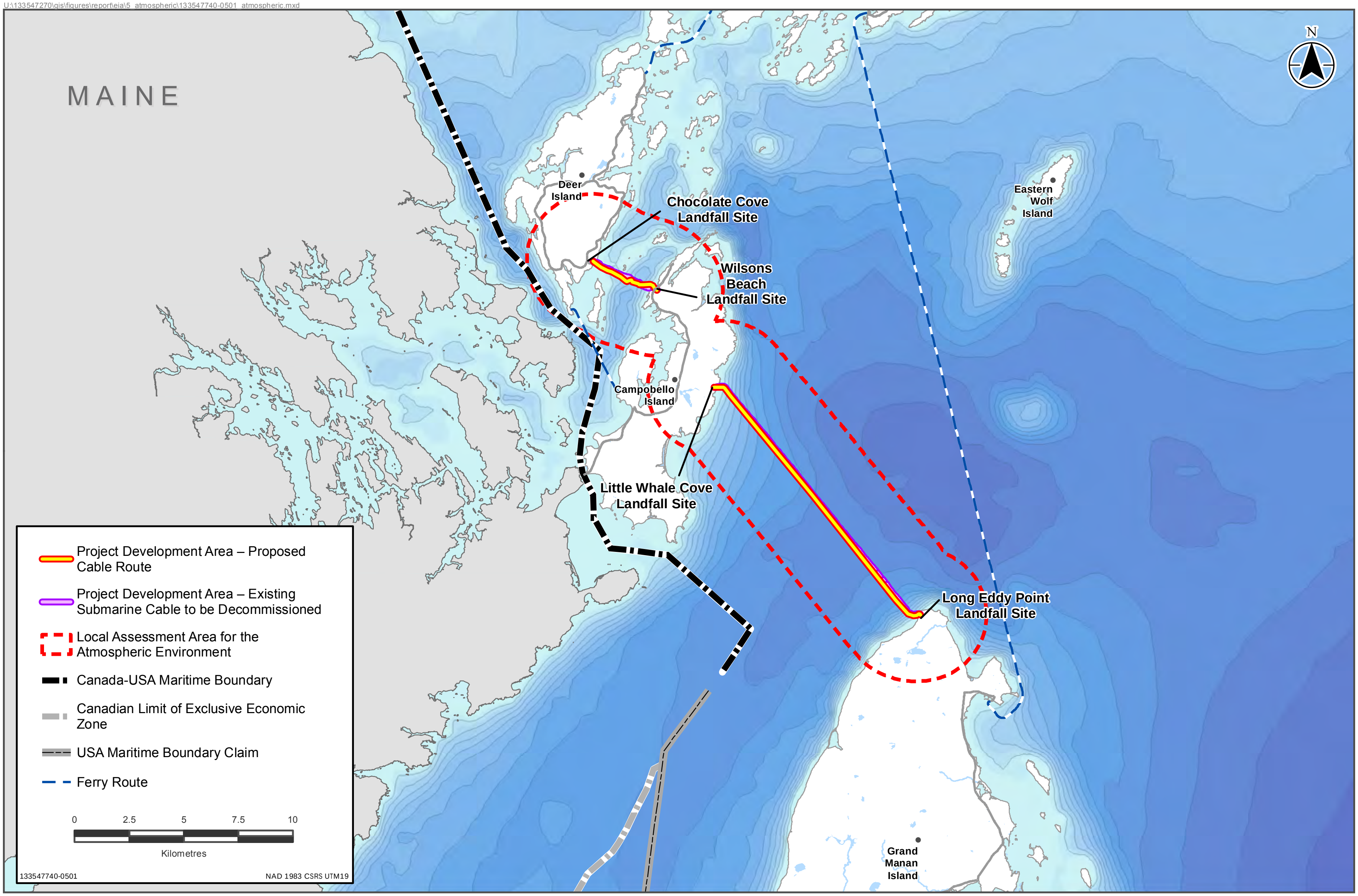
The PDA and LAA for atmospheric environment are shown in Figure 5.1.

5.3.2 Temporal Boundaries

The temporal boundaries for the assessment of the potential environmental effects on the atmospheric environment include:

- construction – scheduled to begin in the spring of 2018 and last for approximately 16 months; and
- operation – scheduled to begin in late 2019 and continue for the life of the new submarine cables, currently anticipated to be at least 40 years.

Decommissioning pertains to both the existing subsea cables and the proposed new subsea cables. Decommissioning of the existing subsea cables would occur at some time following the successful completion of the proposed installation of the new subsea cables as per current regulations and requirements. Decommissioning of the proposed new subsea cables would occur following the end of their useful service life, and would be carried out in accordance with regulations in place at that time.



Source Data: Data provided by the Government of New Brunswick and Canada

Spatial Boundaries for the Atmospheric Environment

Stantec

133547740 - Fundy Isles - NB Power

Figure 5.1

5.4 RESIDUAL ENVIRONMENTAL EFFECTS CHARACTERIZATION AND SIGNIFICANCE DEFINITION

For the purposes of this environmental effects assessment, a significant adverse residual environmental effect on the atmospheric environment is defined below.

For a change in air quality, a significant adverse residual environmental effect is defined as one where Project-related releases of air contaminants degrade the quality of the ambient air such that the Project-related ground-level concentrations (combined with background) are likely to exceed relevant regulatory criteria for ambient air quality, and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence, and the presence of potentially susceptible receptors (e.g., humans, wildlife, vegetation, soils or waterbodies).

For a change in GHG emissions (which is related to climate change), following guidance from the CEA Agency, "*the environmental assessment process cannot consider the bulk of GHG emitted from already existing developments. Furthermore, unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured*" (CEA Agency 2003). It is therefore recognized that it is not possible to assess significance related to an environmental effect on climate change directly on a Project-specific basis. At the same time, it is recognized that a scientific consensus is emerging in respect of global emissions of GHG and consequent changes to global climate as generally representing a significant cumulative environmental effect. Project emissions of GHG would contribute to these cumulative environmental effects. However, its contribution, although measurable, would be very small. Policies and regulations are being developed by the Province of New Brunswick and the Government of Canada for regulating GHG emissions for specific sources or industry sectors; however, none are currently in force.

Thus, instead of setting a specific significance criterion for a change in GHG emissions and determining whether and how it can be met, the assessment involves estimating Project-related GHG emissions and considering the magnitude, intensity, and duration of Project emissions as directed by the CEA Agency guidance (CEA Agency 2003). Three categories are described in the CEA Agency guidance: "low", "medium", and "high". In this EIA, these are attributed quantitatively based on evaluation of GHG emissions from other industrial facilities and regulatory thresholds (such as reporting thresholds for GHG emissions to provincial and federal programs). The magnitude of the Project GHG emissions (on the basis of tonnes CO_2e per year) for this Project is based on the following criteria:

- less than 10,000 tonnes CO_2e per year is considered "low" (since below this level, reporting to the federal program would not be required);
- between 10,000 and 500,000 tonnes CO_2e per year is considered "medium"; and
- greater than 500,000 tonnes CO_2e per year is considered "high".

As per the CEA Agency guidance, where the GHG emissions are considered to be either "medium" or "high", a GHG Management Plan must be prepared.

For a change in acoustic environment, a significant residual adverse environmental effect is one that causes more than a 6.5% change in % HA over baseline (Health Canada 2016).

Criteria used to characterize and describe residual environmental effects for the assessment of atmospheric environment are provided in Table 5.3.

Table 5.3 Characterization of Residual Environmental Effects on Atmospheric Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual environmental effect.	**Positive** – a residual environmental effect that moves measurable parameters in a direction beneficial to the atmospheric environment relative to baseline. **Adverse** – a residual environmental effect that moves measurable parameters in a direction detrimental to atmospheric environment relative to baseline.
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions.	**Negligible** – no measurable change in the measurable parameters. **Low** – Air quality is slightly affected, but is well below objectives, guidelines, or standards; GHG emissions < 10,000 t CO_2e per year; sound pressure levels or peak particle velocity are just noticeably elevated, but do not cause more than a 6.5% change in % HA over baseline. **Moderate** – Air quality is affected to values that are near, but largely below the objectives, guidelines, or standards; GHG emissions are < 500,000 t CO_2e, but > 10,000 t CO_2e; sound pressure levels and peak particle velocity are moderately elevated, but do not cause more than a 6.5% change in % HA over baseline. **High** – Air quality is degraded to values that may substantially exceed the objectives, guidelines, or standards; GHG emissions are > 500,000 t CO_2e; sound pressure levels and peak particle velocity are greater than their respective significance criteria, and cause more than a 6.5% change in % HA over baseline.
Geographic Extent	The geographic area in which a residual environmental effect occurs.	**PDA** – residual environmental effects are restricted to the PDA. **LAA** – residual environmental effects extend into the LAA. **Global** – residual environmental effects extend globally.
Frequency	Identifies how often the residual environmental effect occurs and how often during the Project or in a specific phase.	**Single event** – occurs once **Multiple irregular events** – occurs at no set schedule. **Multiple regular events** – occurs at regular intervals. **Continuous** – occurs continuously.
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual environmental effect can no longer be	**Short-term** – residual environmental effect restricted to short periods (e.g., days/weeks). **Medium-term** – residual environmental effect occurs and lasts for extended periods of time (e.g., months or years). **Long-term** – residual environmental effect extends beyond the life of the Project.

Table 5.3 Characterization of Residual Environmental Effects on Atmospheric Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
	measured or otherwise perceived.	**Permanent** – residual environmental effect does not end.
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the Project activity ceases.	**Reversible** – the residual environmental effect is likely to be reversed after activity completion and reclamation. **Irreversible** – the residual environmental effect is unlikely to be reversed.
Timing	Timing considerations should be noted when it is important in the evaluation of the environmental effect.	**Applicable** – the residual environmental effect is affected by time of day, season, or the ambient conditions at a particular time period. **Not Applicable** – the residual environmental effect is not affected by time of day, season, or the ambient conditions at a particular time period.
Ecological and Socioeconomic Context	Existing condition and trends in the area where residual environmental effects occur.	**Common** – area includes features or characteristics that are common to the LAA or region for air quality and acoustic environments. **Unique** – area includes features or characteristics that are unique to the LAA or region for air quality and acoustic environments.

5.5 EXISTING CONDITIONS FOR ATMOSPHERIC ENVIRONMENT

The atmospheric environment is described in the context of air quality (ambient and emissions, greenhouse gases released) and acoustics/noise.

5.5.1 Approach and Methods

5.5.1.1 Air Quality

Key information for existing air quality included data provided by the most recently published New Brunswick Air Quality Monitoring Results Report for the year 2015 (NBDELG 2017), the most recent year available for this publication at the time of writing. The report summarizes data obtained from the air quality monitoring network that has been operated by the government and industry in New Brunswick to monitor ambient concentrations of various air contaminants in selected New Brunswick communities. The monitoring network was designed by NBDELG primarily to monitor compliance with ambient air quality objectives, and standards.

5.5.1.2 Greenhouse Gases (GHGs)

A literature review was performed to establish the current level of GHG emissions from sources in New Brunswick, Canada, and globally. The ECCC collects GHG emissions information and other relevant data across Canada annually and produces an annual National Inventory Report. The latest National Inventory Report is for the reporting year 2015 (ECCC 2017a).

The World Resources Institute's Climate Analysis Indicators Tool provides a comprehensive database for global GHG emissions data of all major sources and sinks. The latest year for GHG emissions on the database was 2014 (WRI 2015).

5.5.1.3 Acoustic Environment

Sound quality in the PDA is typically influenced by natural sounds such as wildlife, noise from waves and marine vessel travel in the area. No baseline data were collected as the contribution from the Project to sound quality is expected to be limited to construction activities (i.e., temporary and short in duration). Conclusions of this assessment were based on experience and professional judgment of the study team.

5.5.2 Description of Existing Conditions

5.5.2.1 Air Quality

Ambient Air Quality

The NBDELG-operated air quality monitoring station that is located closest to the Fundy Isles is located in St. Andrews. Ground-level ozone and particulate matter less than 2.5 microns ($PM_{2.5}$) are measured at the St. Andrews station. The next closest NBDELG-operated air quality monitoring station to the Fundy Isles is in Saint John (Castle Street). Carbon monoxide, relative humidity, ambient temperature, barometric pressure, sulphur dioxide, $PM_{2.5}$, nitrogen dioxide, ground-level ozone, wind speed, and wind direction are measured at the Saint John station. There have been no exceedances of the ambient air quality standards at Saint John in 2012, 2013, 2014, or 2015 for $PM_{2.5}$, ozone, carbon monoxide, or nitrogen dioxide (NBDELG 2017). Ambient air quality data for 2016 are not yet available. Additionally, the monitoring station in St. Andrews reported results within acceptable standards for ozone and $PM_{2.5}$ over the same periods (NBDELG 2017).

Given that the Fundy Isles are less populated than Saint John and have limited heavy industry, ambient air quality is generally expected to be good most of the time and similar to, or better than, that reported for Saint John or St. Andrews.

Existing Air Contaminant Emissions

The existing air contaminant emissions in New Brunswick, presented below, are based on preliminary data reported to the National Pollutant Release Inventory (NPRI) for 2016 (ECCC 2017). This was the most recent year of quality assured, published data at the time of conducting the assessment. The NPRI requires industrial facilities to report specific air contaminant emissions to Environment Canada when facility reporting thresholds are met. The closest reporting industrial facilities to the PDA are Lake Utopia Paper, a Division of J.D. Irving, Limited (approximately 28 km north of the Project), the Flakeboard Co. Ltd. particleboard and fibreboard mill (approximately 35 km northwest of the Project), the Ganong Inc. candy and chocolate factory in St. Stephen (approximately 33 km northwest of the Project), and the NB Power Point Lepreau Generating Station (approximately 40 km northeast of the Project).

In 2016, 64 New Brunswick facilities reported criteria air contaminant emissions to the NPRI. Table 5.4 provides a summary of provincial and national air contaminant emissions as reported to the NPRI for the 2016 calendar year.

Table 5.4 Comparison of Provincial and National Air Contaminant Emissions (2016)

Value	Combustion Gases			Particulate Matter	
	Sulphur Dioxide (SO_2)	Nitrogen Oxides as Nitrogen Dioxide (NOx as NO_2)	Carbon Monoxide (CO)	PM total	$PM_{2.5}$
Provincial (NB) Total Reported (tonnes), 2016	20,010	14,142	30,130	4,202	1,179
National Total Reported (tonnes), 2016	975,321	585,500	869,987	346,423	49,968
2016 Provincial Percent of National Total (%)	2.05%	2.42%	3.46%	1.21%	2.36%
Source: 2016 NPRI (ECCC 2017)					

New Brunswick's contribution to the national total releases of air contaminants is relatively low, approximately 1.21 to 3.46% of the national totals, on average. There is relatively good air quality experienced in New Brunswick most of the time. This is evidenced by the observed low frequency of exceedance of standards and guidelines and the relatively few industrial air contaminant emissions sources.

5.5.2.2 Greenhouse Gas Emissions

The ECCC collects GHG emissions information and other relevant data across Canada annually and produces an annual National Inventory Report as part of its commitments under the United Nations Framework Convention on Climate Change (UNFCCC). The latest National Inventory Report is for the reporting year 2015 (ECCC 2017a). A comparison of provincial and national GHG emissions for 2015 is presented in Table 5.5.

Table 5.5 Comparison of Provincial and National GHG Emissions (2015)

Value	Carbon Dioxide (CO_2)	Methane (CH_4 as CO_2e)	Nitrous Oxide (N_2O as CO_2e)	Other GHGs (as CO_2e)	Total GHG Emissions (as CO_2e)
Provincial Total Reported (kilotonnes CO_2e), 2015	12,400	1,100	400	231	14,100
National Total Reported (kilotonnes CO_2e), 2015	568,000	102,000	39,000	12,390	722,000
2015 Provincial Percent of National Total (%)	2.2%	1.1%	1.0%	1.9%	1.9%

Note: Source: ECCC 2017a.
Totals for National do not add up in ECCC (2017a) due to rounding.

New Brunswick contributes approximately 1.9% of Canada's GHG emissions.

The estimated carbon dioxide equivalent emissions globally were approximately 36 billion tonnes CO_2e in 2014 (including land use change and forestry) (WRI 2015). Canada's contribution to global GHG emissions is approximately 1.8%.

5.5.2.3 Acoustic Environment

The submarine cable would make landfall at four locations (Chocolate Cove, Wilsons Beach, Little Whale Cove, and Long Eddy Point). The cable landfall sites are located in rural areas with relatively few residential dwellings (Figure 5.1). Sound quality in these areas is typically influenced by light traffic, natural sounds such as wildlife, with noise from ocean waves and marine vessel travel in the area being the dominant noise source. A site visit to the Long Eddy Point and Chocolate Cove landing sites in September 2017 confirmed that noise from waves was the dominant noise source at these sites. The closest sensitive receptor is approximately 60 m from the Wilsons Beach landfall site. Sensitive receptors within 1 km of the PDA are illustrated in Figure 5.2.

Overall, existing sound pressure levels are expected to be typical of rural ambient levels. Based on past research conducted in Alberta, the average rural ambient sound level in Alberta was about 35 dBA at night and 45 dBA during the day (AER 2007). Measurements conducted in other areas of New Brunswick generally agree with these values. Based on the limited interaction expected from the Project on sound quality, no background monitoring was conducted for the Project. For the purpose of this assessment, ambient sound levels are assumed to be 35 dBA at night and 45 dBA during the day.

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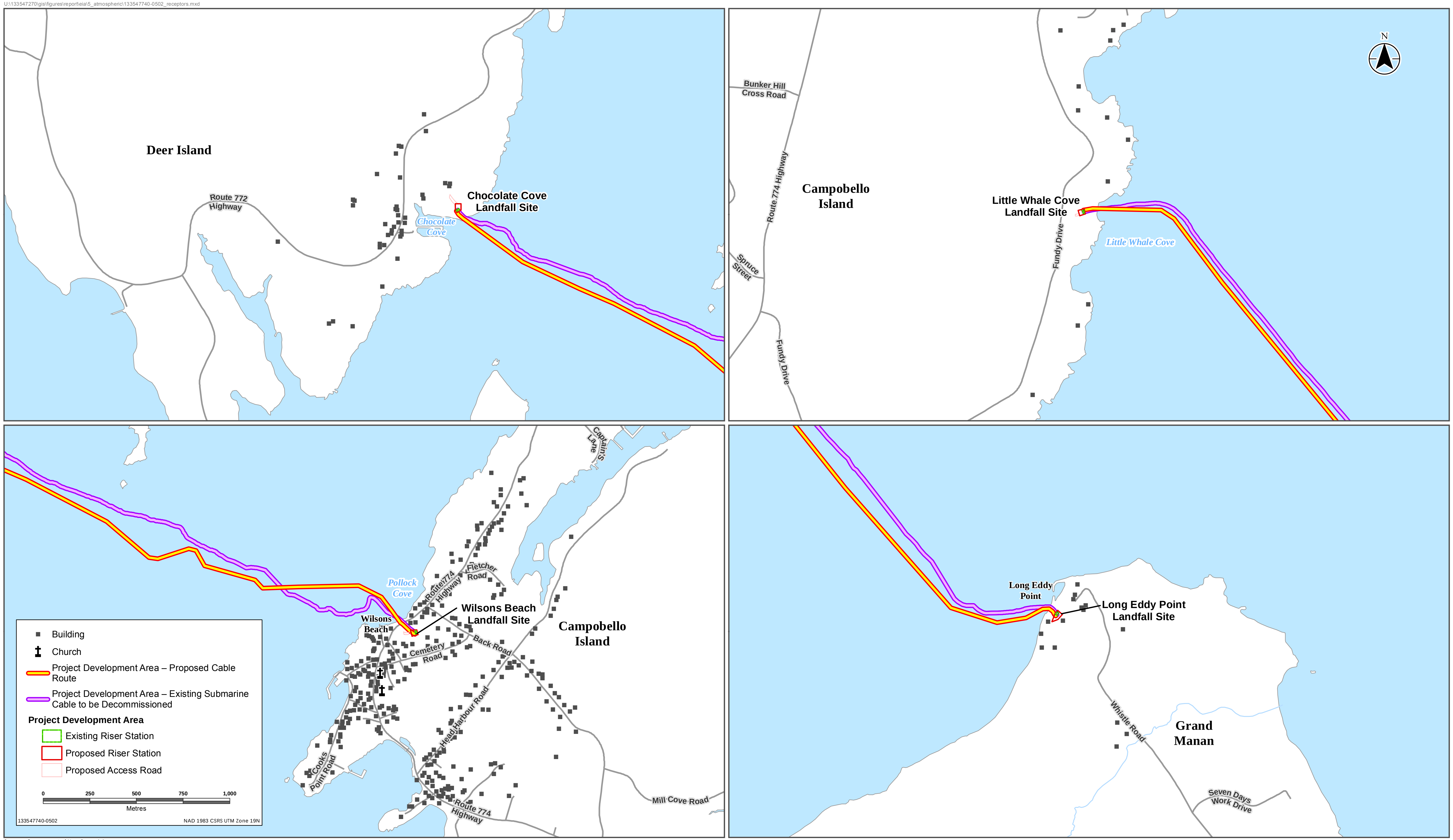

Sources: Government of New Brunswick

Sensitive Receptors within 1km of Project Development Area

Stantec

133547740 - FUNDY ISLES - NB POWER

Figure 5.2

5.6 PROJECT INTERACTIONS WITH THE ATMOSPHERIC ENVIRONMENT

Table 5.6 identifies the physical activities that may interact with the atmospheric environment and result in the identified environmental effect. These interactions are discussed in detail in Section 5.7, in the context of environmental effects pathways, standard and Project-specific mitigation/enhancement, and residual environmental effects. A justification for no environmental interaction is provided.

Virtually every activity being carried out for the Project may create emissions or noise and interact with the atmospheric environment. Because of this, the assessment is conducted for one all-encompassing category in each phase called “emissions and wastes”, to reflect the fact that emissions would be generated from various activities at various times and thus assess emissions and wastes collectively rather than separately for each individual activity.

The construction activities would result in releases of air contaminants to the atmosphere, consisting mainly of combustion gases from the operation of on-site construction equipment and large trucks used to deliver equipment to the site. There may also be some fugitive dust generated as a result of excavation activities. The operation activities would result in releases of air contaminants to the atmosphere, consisting mainly of combustion gases from the operation of on-site maintenance equipment. There may also be some fugitive dust generated as a result of vegetation management activities. The change in air quality as a result of construction, operation, and decommissioning activities is therefore considered under emissions and wastes.

The construction activities would result in releases of GHGs, predominantly from fuel combustion in heavy equipment and trucks. The operation activities would result in releases of GHGs, predominantly from fuel combustion from heavy equipment from maintenance/management activities. The change in GHGs as a result of construction, operation, and decommissioning activities is therefore considered under emissions and wastes.

The construction activities would result in sound emissions, predominantly from the operation of heavy equipment and from transportation vehicles on Project access roads. The operation activities would result in sound emissions, predominantly from heavy equipment from maintenance/management activities. The change in sound quality as a result of construction, operation, and decommissioning activities is therefore considered under emissions and wastes.

Finally, no blasting activities are expected during construction and minimal vibration is expected during HDD activities at each landfall site. No substantive vibration levels are expected to occur during Project operation and are expected to be similar or less than those that would occur during construction. The environmental effects of vibration are therefore not further discussed in this assessment.

Table 5.6 Project-Environment Interactions with the Atmospheric Environment

Physical Activities	Potential Environmental Effects		
	Change in Air Quality	Change in GHG Emissions	Change in Acoustic Environment
Construction			
Landfall construction	-	-	-
Modification to cable riser stations	-	-	-
Cable installation in Head Harbour Passage and Grand Manan Channel	-	-	-
Clean-up and revegetation	-	-	-
Inspection and energizing the Project	-	-	-
Emissions and wastes	✓	✓	✓
Land-based transportation	-	-	-
Marine transportation	-	-	-
Employment and expenditure	-	-	-
Operation			
Vegetation management	-	-	-
Access road maintenance	-	-	-
Energy transmission	-	-	-
Infrastructure inspection, maintenance, and repair	-	-	-
Emissions and wastes	✓	✓	✓
Land-based transportation	-	-	-
Marine transportation	-	-	-
Employment and expenditure	-	-	-
Decommissioning			
Decommissioning of existing cables	-	-	-
Reclamation	-	-	-
Emissions and wastes	✓	✓	✓
Land-based transportation	-	-	-
Marine transportation	-	-	-
Employment and expenditure	-	-	-

Notes:
✓ = Potential interaction
– = No interaction

5.7 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON THE ATMOSPHERIC ENVIRONMENT

5.7.1 Change in Air Quality

5.7.1.1 Analytical Assessment Techniques

Air contaminants would be released principally from construction activities. Emissions from activities during operation are expected to be nominal originating only from maintenance activities.

Emissions were estimated for key Project activities during construction that may cause air contaminants to be released to the atmosphere. These include:

- dust from topsoil and overburden removal;
- dust from handling operations (e.g., loading and dumping) of topsoil, rock, and overburden;
- dust from equipment movements on unpaved (construction) roads; and
- diesel combustion in construction (e.g., loaders, dump trucks).

Diesel combustion air contaminant emissions estimates from construction equipment are based on assumed equipment working hours, typical equipment characteristics including horsepower and load factor, and CAC emission factors from the US EPA NONROAD program (US EPA 2008). The horsepower, load, operating hours, and equipment-specific emission factors were multiplied to yield the CAC emissions for each piece of equipment.

Emissions during operation are expected to be very low, and emissions during decommissioning are expected to be less than construction, and therefore were not quantified.

5.7.1.2 Project-Environmental Effects Pathways

During construction, CAC emissions from activities such as site preparation and the construction of various Project components would result in increases in the overall level of CAC emissions. Increased emissions may cause an increase in ground-level concentrations of CACs. The duration of construction is expected to be approximately 16 months.

During operation, CAC emissions would be generated only from vehicles during Project maintenance, and none from operation of the power lines. These activities would result in small increases in the overall level of CAC emissions. Emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction.

5.7.1.3 Mitigation

Throughout construction, operation, and eventual decommissioning, NB Power would control CAC emissions from Project activities by implementing the following mitigation measures:

- manage vehicle and equipment emissions by conducting regular maintenance on all machinery and equipment (both construction and operation);

- control construction-related fugitive road dust, through measures such as speed limits on Project-controlled gravel roads and road watering on an as-needed basis;
- prohibit the burning of waste materials; and
- reduce haul distances to disposal sites.

NB Power is committed to continuous improvement and will continue to evaluate opportunities to reduce emissions throughout construction, operation and maintenance, and eventual decommissioning.

5.7.1.4 Characterization of Project Residual Environmental Effects

The equipment, horsepower, and operating hours of the heavy construction equipment to be used during construction are identified in Table 5.7.

Table 5.7 Construction Equipment Characteristics and Air Contaminant Emissions

Equipment Type	Net horsepower (hp)	Operating Hours (h)	Air Contaminant Emissions for Construction Period – 16 months (t)			
			SO_2	NO_X	CO	PM
D6T Crawler Tractor	200	72	3.00E-05	2.38E-03	1.12E-03	8.12E-05
Utility Line Trucks (3)	N/A	576	N/A	N/A	N/A	N/A
Drilling Equipment	300	120	5.41E-05	4.34E-03	1.09E-03	1.45E-04
Gravel Truck	474	48	4.74E-05	3.77E-03	1.78E-03	1.32E-04
¾ Ton Support Vehicles	N/A	864	N/A	N/A	N/A	N/A
428E Backhoe/ Loader	100	72	6.93E-06	4.24E-04	9.30E-04	1.43E-05
Tug	1,000	216	6.53E-02	3.41E-01	2.51E-01	1.51E-02
Cable Ship	2,500	576	9.69E-01	7.30E+00	3.73E+00	5.37E-01
Total		2,544	1.03	7.66	3.98	0.55
SOURCE: US EPA 2008, Caterpillar 2012.						

The total emissions of air contaminants during construction were estimated and are shown above in Table 5.7. Total emissions of sulphur dioxide from Project construction are estimated at 1.03 tonnes; total emissions of nitrogen oxides, carbon monoxide, and total particulate matter from Project construction are estimated at 7.66 tonnes, 3.98 tonnes, and 0.55 tonnes, respectively, spread over the 16-month construction period. These construction emissions are low in magnitude relative to other similar projects in the power sector. During the construction period, these emissions are not likely to cause poor air quality in the Bay of Fundy or on the Fundy Isles, as they are low in magnitude and mitigation will be used to control emissions to maintain good air quality near the Project.

Based on the above, the residual environmental effects of the Project are predicted to be adverse, since they would add to existing air contaminant concentrations in the LAA. They would be low, and generally confined to the PDA and perhaps extending to the LAA on occasion. Based on experience with construction project air contaminant emissions, the main concern in relation to air quality is dust, which can approach ambient objectives in dry, windy periods. During the construction period, dust emissions are not likely to cause poor air quality in the Bay of Fundy or on the Fundy Isles, as they are low in magnitude and mitigation would be used to control dust emissions to maintain good air quality near the Project. Other air contaminants (SO_2, NO_x and CO) are not expected to contribute measurably to existing ambient levels most of the time during construction, as they are low in magnitude in comparison to the emissions reported to the NPRI. These effects are expected to be similar during the operation and decommissioning phases, though likely less than during construction.

5.7.2 Change in GHG Emissions

5.7.2.1 Analytical Assessment Techniques

The GHGs are released into the atmosphere principally from fuel combustion. Other GHG sources, such as fugitive releases, are not likely to occur and are therefore not relevant to the assessment.

Emissions of GHGs (CO_2, CH_4, and N_2O) from diesel combustion in construction equipment were estimated considering approximate equipment working hours, fuel consumption rate, and GHG emission factors from the National Inventory Report (ECCC 2017b). The equipment working hours were used with the fuel consumption rate to determine the total volume of diesel combusted. Volume-based diesel combustion factors were then applied to estimate emissions of CO_2, CH_4, and N_2O.

The carbon dioxide equivalent, or CO_2e, is determined by measuring the GHG emissions weighted by its associated global warming potential (GWP) for each gas, relative to CO_2. The GWP for a gas is used to compare its global warming impact with another gas (US EPA 2017). The GWP compares how much heat would be trapped in the atmosphere compared to a similar mass of CO_2 (reference gas). Therefore, the higher the GWP, the more warming to the atmosphere would result from that gas.

The CO_2e calculation from CO_2, N_2O and CH_4 emissions is as follows:

$$CO_2e = CO_2 \times GWPCO_2 + CH_4 \times GWPCH_4 + N_2O \times GWPN_2O$$

In this assessment, the total GHG emissions (t CO_2e) from construction are estimated and magnitude is compared to the CEA Agency guidance criteria of “low”, “medium” and “high” (CEA Agency 2003). Criteria of the CEA Agency guidance categories are described in Section 5.4.

5.7.2.2 Project Environmental Effects Pathways

Releases of GHGs would occur in small quantities from fuel combustion in heavy equipment and trucks used for Project activities. The quantities of GHGs released to the atmosphere during Project construction are expected to be very small in comparison to provincial and national totals. These can be partially mitigated through the use of well-maintained equipment and implementation of an idling awareness program to reduce unnecessary idling.

Releases of GHGs would occur during operation of the Project only during maintenance activities, which are expected to use very small quantities of fuel. Emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction. Therefore, no substantive emissions of GHGs are expected to occur during Project operation and decommissioning; thus, this issue is not discussed further.

5.7.2.3 Mitigation

Emissions of GHGs during construction would be reduced to the extent practical by:

- using construction equipment that is well maintained;
- implementing an idling awareness program to reduce unnecessary idling; and
- reducing haul distances to disposal sites.

5.7.2.4 Characterization of Project Residual Environmental Effects

The equipment, operating hours, and fuel rates of the heavy construction equipment to be used during construction are identified in Table 5.8. The equipment hourly fuel rates are based on manufacturer specifications and the operating hours are estimated based on the construction activities.

Table 5.8 Construction Equipment Characteristics and GHG Emissions

Equipment Type	Litres of diesel/h	Operating Hours (h)	Total Fuel (L)	Total Emissions (t) – 16 months			
				CO_2	CH_4	N_2O	CO_2e
D6T Crawler Tractor	19	72	1,368	3.68	0.0002	0.0014	4.09
Utility Line Trucks (3)	25	576	14,400	38.74	0.0022	0.0144	43.08
Drilling Equipment	16.7	120	2,000	5.38	0.0003	0.0020	5.98
Gravel Truck	25	48	1,200	3.23	0.0002	0.0012	3.59
¾ Ton Support Vehicles	4.2	864	3,600	9.68	0.0005	0.0036	10.77
428E Backhoe/ Loader	19	72	1,368	3.68	0.0002	0.0014	4.09
Tug	750	216	162,000	111.78	0.0146	0.0032	113.11
Cable Ship	1,464.1	576	521,998	1,404.17	0.1305	0.0381	1,418.79
Total	2,323	2,544	707,934	1,580.3	0.1487	0.0653	1,603.51
SOURCE: US EPA 2008, Caterpillar 2012.							

The volume of fuel and the WCI emission factors (2012) were used to estimate emissions for each gas (CO_2, CH_4, N_2O). The total GHG emissions from construction activities are estimated to be approximately 1,603.51 tCO_2e spread over the 16-month construction period.

Based on the above, the residual environmental effects of the Project during construction are predicted to be adverse, since there is an increase in GHG emissions. The magnitude is less than 10,000 t CO_2e/year and therefore the emissions are estimated to be low. These environmental effects are expected to be similar during the operation and decommissioning phases, though likely less than during construction.

5.7.3 Change in Acoustic Environment

5.7.3.1 Analytical Assessment Techniques

Sound levels due to construction activities were not quantitatively assessed, as baseline monitoring was not conducted for this assessment. A qualitative assessment, based on Project activities during construction, operation and maintenance, and decommissioning, and distances from nearby receptors, is provided in Section 5.7.3.4.

The conclusions in this section are derived primarily from the conclusions from relevant biophysical assessments, past project experience, and professional judgment.

5.7.3.2 Project-Environmental Effects Pathways

During construction, sound emissions would result from the operation of heavy equipment (for excavating and vegetation clearing) and from transportation vehicles on Project access roads. Noise would, however, remain largely confined to the PDA and the immediately adjacent areas, and would be temporary. Construction would be limited to daytime hours, if possible, to reduce disturbance and annoyance to the nearest residences. The closest sensitive receptor is 60 m from the Wilsons Beach landfall site. Refer to Figure 5.2 for sensitive receptors within 1 km of the PDA.

There would be potentially high noise levels during HDD activities and disturbance to site-specific land uses associated with the HDD drilling activities at each of the landfall sites; however, these events are expected to be temporary. If noise complaints from local residents are received, the information would be evaluated and additional mitigation may be required.

No substantive sound emissions are expected to occur during Project operation. Sound emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction.

5.7.3.3 Mitigation

The following mitigation for sound during construction would be considered and implemented, as needed:

- use of well-maintained construction equipment with appropriate mufflers;
- timing activities to avoid undue nuisance to off-site receptors (e.g., limiting construction activities to between 7:00 am and 7:00 pm, where possible);
- use of acoustical barriers (e.g., engineered materials or stockpiled overburden) near loud sources during construction if feasible;
- sizing of construction equipment to the smallest needed to perform the work;
- establishing a noise complaint and response system; and
- notifying nearby residents prior to construction to reduce the likelihood of annoyance.

5.7.3.4 Characterization of Project Residual Environmental Effects

Construction activities are to occur during daylight hours only (7:00 am to 7:00 pm), where possible. As such, the increase in sound pressure levels (SPL) would be limited to daytime SPL (L_d) and there is not expected to be an increase in nighttime SPL (L_n). Due to the intermittent nature of the construction activities (i.e., not continuous over the 16-month construction period) and based on the professional judgment and experience of the study team with similar projects, the change in %HA during construction is expected to be less than 6.5%.

The operation activities would result in sound emissions, predominantly from heavy equipment from maintenance/management activities. Sound emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction.

The change in %HA during operation are expected to be less than 6.5% and therefore Project-related effects on sound quality are not expected to be substantive.

Residual environmental effects on acoustic environment during Project construction are expected to be adverse in direction, low in magnitude, to be limited to the LAA, and to be short-term in duration. The effects are characterized as reversible because once the construction activities cease, the sound pressure levels in the LAA are likely to return to baseline levels. These environmental effects are expected to be similar during the operation and decommissioning phases, though likely less than during construction.

Based on the reasons above, and the implementation of known and proven mitigation, the noise levels are expected to be low and not frequently exceed the noise guidelines. Therefore, Project-related effects on sound quality are not expected to be substantive.

5.8 SUMMARY OF PROJECT RESIDUAL ENVIRONMENTAL EFFECTS

Table 5.9 summarizes the environmental effects assessment and prediction of residual environmental effects resulting from those interactions between the Project and the atmospheric environment rated as having a potential interaction.

Table 5.9 Summary of Project Residual Environmental Effects on the Acoustic Environment

Residual Environmental Effect	Residual Environmental Effects Characterization								
	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Timing	Reversibility	Ecological and Socioeconomic Context
Change in air quality	C	A	L	LAA	ST	R	A	R	C
	O	A	N	PDA	ST	IR	A	R	C
	D	A	N	LAA	ST	R	A	R	C
Change in GHG emissions	C	A	L	G	ST	R	A	R	C
	O	A	N	PDA	ST	IR	A	R	C
	D	A	N	G	ST	R	A	R	C
Change in acoustic environment	C	A	L	LAA	ST	R	A	R	C
	O	A	N	PDA	ST	IR	A	R	C
	D	A	N	LAA	ST	R	A	R	C

KEY
See Table 5.3 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
G: Global

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term
N/A: Not applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Timing:
A: Applicable
N/A: Not applicable

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socioeconomic Context:
C: Common
U: Unique

For a change in air quality during construction, the direction of the environmental effects during construction is characterized as adverse, since emissions have the potential to decrease air quality. The magnitude of a change in air quality is predicted to be low, because existing air quality is considered good and adequate mitigation is available and planned to manage the emissions of air contaminants from construction. The geographic extent is limited to the LAA, but mostly concentrated within the PDA. The duration and frequency are predicted to be medium-term and continuous, respectively. Timing is applicable because wind-borne dust would require mitigation mainly during dry, windy conditions and construction activities would be limited to daytime hours. The environmental effects are characterized as reversible, because once the construction activities cease, ambient air quality concentrations would return to background levels. The ecological and socioeconomic context is common, as there are other sources within the LAA that release air contaminants (e.g., local traffic). The Project is not expected to cause a change in air quality during operation. The release of air contaminants during eventual decommissioning are expected to be similar or less than those that would occur during construction.

For a change in GHG emissions, the direction of the environmental effects during construction is characterized as adverse, since emissions have the potential to affect the provincial and national totals, and the provincial and federal GHG reduction targets. The magnitude of those GHG emissions is characterized as low, because the GHG emissions during construction would be less than 10,000 t CO_2e per year. The geographic extent is global for GHG emissions as climate change is a global phenomenon. The duration of GHGs is considered medium-term and frequency is predicted to be multiple regular event (during heavy equipment activities only). Timing is applicable because construction activities would be limited to daytime hours. The environmental effects are characterized as irreversible because GHGs remain in the atmosphere for a relatively long time after being emitted, ranging from decades to thousands of years depending on the GHG. The ecological and socioeconomic context is common, in that GHG emissions occur from various existing sources in the LAA. During operation, the Project is not considered to cause a substantive change in GHG emissions. The GHG emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction. The Project-related GHG emissions are not expected to substantively affect the GHG reduction targets.

For a change in acoustic environment, the direction of the environmental effects during construction is characterized as adverse, since they would change the condition of the acoustic environment in a negative way. The magnitude of the sound emissions is characterized as low, because the %HA from construction activities is predicted to be below the Health Canada guidance level (< 6.5%). The geographic extent is limited to the LAA, but mostly concentrated within the PDA, as sound energy is expected to attenuate to (or near to) background levels at the LAA boundary. The duration is predicted to be short-term and the frequency is predicted to be multiple regular event (during equipment operation only). The environmental effects are characterized as reversible because sound levels are expected to return to baseline levels once construction activities have been completed. Timing is applicable because construction activities would be limited to daytime hours. The ecological and socioeconomic context is common, in that sound emissions occur from various existing sources in the LAA. During operation, the Project is not considered to cause a substantive change in acoustic environment. Sound emissions during eventual decommissioning are expected to be similar or less than those that would occur during construction.

5.9 DETERMINATION OF SIGNIFICANCE

With the application of proposed mitigation and environmental protection measures, the residual environmental effects of a change in air quality from Project activities and components are predicted to be not significant. This conclusion has been determined with a high level of confidence based on a good understanding of the general effects of construction activities on air quality and the effectiveness of mitigation measures discussed in Section 5.7.1.3.

Using the magnitude scale of low, medium, and high, as defined in Section 5.4, the Project is considered to have a low magnitude. Emissions of GHGs from Project activities would be small in comparison to provincial and national emissions.

With the application of proposed mitigation and environmental protection measures, the residual environmental effects of a change in acoustic environment from Project activities and components are predicted to be not significant. This conclusion has been determined with a moderate to high level of confidence based on a good understanding of the general effects of construction activities on the acoustic environment and the effectiveness of mitigation measures discussed in Section 5.7.3.3.