



Appendix 2: Revised Environmental Assessment Section 4.0

This appendix contains the revised Section 4.0 of the Registration, updated to address EPR items 084 through 135, where applicable. All revisions are clearly underlined. The information presented herein supports the Predicted Environmental Effects and summarizes the outcomes of the updated effects assessment.

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4.0 Environmental Effects

Environmental effects are the potential positive or negative interactions the Project may have with the surrounding environment inside the Project Area (PA), Local Assessment Area (LAA), or Regional Assessment area (RAA). North Atlantic is taking a precautionary approach to the Project, ensuring that preventative measures are planned wherever a possible negative interaction is identified.

Environmental effects were assessed for each of the VCs, including the Atmospheric, Aquatic, Terrestrial, Socioeconomic environments, Land Resource Use, Heritage and Cultural Resources, and Human Health and Quality of Life. In addition, this section presents an overview of methods for conducting the effects assessment, a comprehensive analysis of any predicted effects of the proposed Project, a risk evaluation of accidents and malfunctions, a description of the effects over the expected temporal lifespan, and an overview of proposed mitigations. Mitigation measures were proposed to avoid, minimize, rehabilitate, or compensate for any significant impacts from the Project, and are discussed in Section 4.5.

A Cumulative Effects assessment was also conducted to evaluate the combined effects of the Project with other past, present or future projects in the RAA. This included all projects with an environmental footprint inside the RAA that were registered with NL EAD.

The approach and methods for the Effects Assessment are based on the current requirements and recommendations of NL DECC, including the following pieces of legislation and guidance documents:

- **NL Environmental Protection Act**, SNL 2002 cE-14.2;
- **NL Environmental Assessment Regulations**, 2003;
- “Environment Assessment: A Guide to the Process”, 2025; and
- “Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects”, 2023.

The effects assessment was comprised of the following components:

- A compilation of detailed information about the existing environment to establish baseline conditions;
- A spatial and temporal analysis of potential interactions with the existing environment;
- The selection of mitigation measures to avoid, minimize, or compensate (where appropriate) Project effects on the environment and communities;

- The development of contingency plans to address worst-case scenario, Project-related accidents and malfunctions;
- Establishment of plans for follow-up and monitoring programs to facilitate effects management and verify Project-related effects predictions; and
- A description of other projects in the RAA to identify possible interactions with the Project and potential cumulative effects.

The foundation for the analysis of residual and cumulative effects was established in Section 4, but the details are provided in Sections 5 and 6, respectively.

Sections 4 to 6 of this document describe the potential effects of the Project, and incorporate information from:

- Project Description (i.e., proposed Project components and activities);
- Applicable municipal, provincial, and federal regulations;
- Applicable policies and guidance documents;
- Environmental and socio-economic regulatory advice;
- Knowledge of the biophysical and socio-economic environments;
- Engagement with the public, Indigenous peoples, and stakeholders; and
- Experience with other development projects in NL.

4.1 Effects Assessment Methods

The purpose of the environmental effects assessment was to identify, predict, and reduce or avoid potential negative environmental interactions with the Project, and to predict the significance of residual negative effects. The following section comprises the various steps involved in environmental effects predictions, including the definition of the scope and boundaries, selection of VCs, establishment of baseline conditions, and identification of potential interactions with the Project. The effects were then predicted with consideration of mitigation measures, followed by the identification of, and determination of the significance of residual effects. The assessment also included methods for evaluating cumulative effects, accidents and malfunctions, and the effects of the environment on the Project.

4.1.1 Scope Definition

Defining the scope required establishing boundaries for the Project, incorporating temporal, spatial and administrative factors, and reflecting regulatory, policy, and economic requirements or restrictions. Scoping incorporated NL DECC guidelines, relevant literature, approaches used in similar projects, and

consultations with key stakeholders such as the public, Indigenous peoples, and regulatory agencies. Assessment boundaries varied between VCs based on their specific characteristics and the extent of interaction with the Project.

Spatially, the Project used three tiers of assessment: the PA, the LAA, and the RAA. The PA encompassed the physical footprint of the undertaking and a spatial buffer to facilitate minor infrastructure adjustments during construction. The LAA and the RAA encompassed areas where indirect interactions could occur between the Project and environmental receptors, depending on activity, timing, and sensitivity. Boundaries were set to capture the furthest extent of potential influence from the Project. Administrative boundaries such as designated watersheds, public water supply areas, municipalities, and planning zones, were also considered.

The temporal boundaries represented the duration over which Project activities could interact with each VC. These boundaries applied to Project phases (Construction, O&M, Decommissioning and Rehabilitation) and to specific activities. Temporal boundaries varied by VC where adjustments were necessary. For this Project, the overall temporal boundaries spanned a period of 34 years: Construction (3 years), O&M (30 years), and Decommissioning and Rehabilitation (1 year).

4.1.2 Valued Component Selection

Concerns regarding the Project facilitated the selection of VCs, which are environmental, socio-economic, and cultural elements considered important to the public, Indigenous peoples, and regulators. In addition to the guidance from regulators, consultation and engagement activities identified specific concerns related to the Project. Section 8 summarizes engagement activities, which included meetings and correspondence with regulators, stakeholders, Indigenous and community organizations, and special interest groups. These concerns were subsequently organized by human and biophysical environments and used to help determine or confirm the VCs considered in the environmental effects prediction.

The assessment of each VC began with a definition and a brief overview of what was included (e.g., biological taxonomic groups or socio-economic interests), along with the rationale for its inclusion. KIs were identified for each VC, and measurable parameters were selected to describe the baseline status of the VCs to assess potential future changes in the KIs resulting from the Project. Methods to establish baseline conditions were summarized by VC in Section 4.2.

Table 4.1-1 lists the VCs and KIs considered in the effects assessment, which were based on:

- Conformance with *Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* (Department of Environment and Climate Change, 2023), which considered:
 - Technical aspects of wind energy and green hydrogen projects;
 - Potential for presence and interaction with the Project and sensitivity to effects;
 - Applicable municipal, provincial, and federal legislation such as SAR;
 - Regulatory guidance from provincial and federal government agencies;
 - Ecological and socio-economic importance to Indigenous peoples, communities and the public; and
 - Similar projects that have occurred in the region or other jurisdictions.

Table 4.1-1 Valued Components and Key Indicators.

Valued Component	Key Indicator
Atmospheric Environment	Air Quality
	Greenhouse Gas (GHG) Emissions
	Light
	Sound Quality (Noise)
	Vibration
Aquatic Environment	Groundwater Resources
	Surface Water Resources
	Freshwater Fish and Fish Habitat
	Marine Fish and Fish Habitat
	Fisheries and Aquaculture
	Species at Risk (SAR)
	Habitats of Conservation Concern
Marine Biosecurity	
Terrestrial Environment	Flora
	Wetlands
	Fauna (Mammals)
	Avifauna
	Rare Lichens
	Bats
SAR Insects	
Land and Resource Use	Land Use Planning and Development Control
	Industrial and Commercial Land Use
	Tourism and Recreation
	Harvesting
	Indigenous Land Use

Valued Component	Key Indicator
Heritage and Cultural Resources	Historic and Archaeological Resources
	Architectural Resources
	Paleontological Resources
Socio-Economic Environment	Population Demographics
	Community Health and Wellbeing
	Infrastructure and Services
	Economy
	Employment
	Business
Human Health and Quality of Life	Air Quality ¹
	GHG ¹
	Light ¹
	Sound Quality (Noise) ¹
	Vibration ¹
	Shadow Flicker
	Ice Throw
	Tourism and Recreation ²
Indigenous Land Use ²	
Notes ¹ Assessed in Atmospheric Environment ² Assessed in Land and Resource Use	

4.1.3 Baseline Conditions

Baseline conditions were documented for each biophysical and socio-economic VC to characterize the existing environment, establish an understanding of the receiving environment, and provide sufficient context to examine the potential interaction between the Project and existing conditions in the PA, LAA and RAA. The review of existing baseline conditions also served to identify potential gaps important to the effects assessment, and hence the need for field data collection.

The review of existing conditions focused on information necessary to support effects assessment, the development of mitigation measures, and anticipated monitoring and follow-up programs. The various methods employed to collect baseline information for each VC were documented and described in individual reports, particularly those involving primary field data collection.

Existing environmental conditions were summarized for each VC within the effects assessment sections, with additional details provided in Section 3. The baseline studies that have been completed in support of the Project are appended, where available.

4.1.4 Results of Consultation and Engagement

The results of public consultation and engagement were considered in the effects assessment, including North Atlantic's commitments on mitigation, compliance, and effects monitoring programs. North Atlantic remains committed to ongoing engagement. Consultation with Indigenous peoples, stakeholders, communities and government agencies had been ongoing since 2022. Key issues and concerns raised during consultation and engagement related to Project activities were outlined for each VC, as relevant.

4.1.5 Project-Environment Interactions

Interactions between Project activities and the identified KIs were either direct or indirect. Direct interactions were based on a review of Project activities and existing biophysical and socio-economic conditions and characteristics. Indirect interactions typically required an active pathway that linked a Project activity with a KI.

As an example, a direct effect could have been the potential loss of a wetland due to clearing, grubbing and grading in preparation for construction. Clearing, grubbing and grading could also have decreased infiltration and therefore increased runoff, resulting in a potential indirect effect on surface water quality and quantity. Diminished surface water quality and quantity could have affected fish and fish habitat; this was an example of a KI acting as both the receptor of an effect and the pathway for an interaction.

To determine the potential direct and indirect interactions between Project activities and VCs, the EA team:

- Reviewed the anticipated components and activities required to construct, operate and close the Project;
- Identified potential accidents and malfunctions associated with Project activities in all phases; and
- Selected those KIs that could be directly or indirectly affected by Project activities through potential interactions.

Table 4.1-2 presents summary descriptions of the anticipated Project components and activities that could interact with elements of the environment. Identified interactions with the VCs and KIs are presented in Section 4.2. Full descriptions of Project components and activities appear in Section 2. Potential accidents and malfunctions are fully described and evaluated in Section 4.3.

Table 4.1-2 Summary of Project components and activities.

Phase, Component	Description
Construction	
Site Preparation	Clearing of vegetation, surface grubbing/grading and fill placement at work sites, building and structures sites, and laydown areas.
Roads	Construction of new access roads, widening and resurfacing of existing roads, and quarrying operations.
Staging and Laydown	Installation of temporary facilities including wind turbine staging areas, construction compounds and laydown areas.
Temporary Batch Plant	Construction and operation of a temporary concrete batch plant.
Equipment and Materials Transport	Road and marine transportation of construction vehicles, equipment and materials.
Wind Turbine Foundations	Installation of wind turbine foundations and crane pads including necessary blasting, excavation, and construction.
Electrical Infrastructure	Installation of electrical collector lines, substations and transmission infrastructure.
Wind Turbine Installation	Installation and assembly of wind turbine components including the tower, rotor blades, and nacelle. Anchoring the wind turbine to the foundation. Installation of meteorological evaluation tower.
Hydrogen Generation Plant	Construction and installation of the HGP including the building foundations and envelope, electrolyzers, and associated works to produce hydrogen. Includes construction of infrastructure necessary to supply water of adequate quality to the HGP, facilitate transfer of hydrogen to the HP, and to store hydrogen as well as process byproducts.
Hydrogenation Plant	Construction and installation of the HP including building foundations and envelope, and associated works to produce methylcyclohexane from toluene and hydrogen. Includes construction of infrastructure necessary to feed toluene from the storage tank to the plant, and to feed MCH from the plant to the storage tank.
Toluene and MCH Storage and Transfer	Conversion of North Atlantic's storage tanks to contain toluene and MCH including component retrofits, and associated construction works. Includes necessary component changes at NARL Logistics Terminal and construction of pipeline for facilitating transfer to and from marine vessels.
Flare Stacks	Installation of storage and process flare stacks to manage emissions.
Administration Buildings	Construction of administrative buildings and related infrastructure.
Temporary Workforce Accommodations	Potential installation of temporary workforce accommodations buildings and related infrastructure at Bull Arm Fabrication Site.
Employment and Expenditures	Direct and indirect spending on employment and goods/materials and services procurement.
Operation and Maintenance	
Wind Turbine Operation	Operation of wind turbine - and associated outputs including noise generation, vibration, shadow flicker, lighting, and ice throw.
Wind Turbine Maintenance	Preventative and unplanned maintenance of wind turbine components.
Electrical Infrastructure	Operation, preventative and unplanned maintenance of the electrical collector system, substations, and transmission system.
Venting and Flaring	Release of hydrogen or other gases either as flares or to air during regular maintenance.
Road Maintenance	Maintenance and use of access roads associated with wind turbines and electrical infrastructure.
Hydrogen Generation Plant	Operation, preventative and unplanned maintenance of hydrogen electrolyzers, water consumption, discharge; fuel/lubricant storage and transfer; temporary hydrogen storage; byproduct storage; hydrogen transfer to HGP.

Phase, Component	Description
Hydrogenation Plant	Operation, preventative and unplanned maintenance of plant components to produce MCH from toluene and hydrogen; transfer of toluene and MCH to and from storage.
Toluene and MCH Storage and Transfer	Storage of feedstock (toluene) and derivative (methylcyclohexane) products, transfer to and from marine vessels, and shipment.
Administration Buildings	O&M of administration buildings.
Employment and Expenditures	Direct and indirect spending on employment and goods/materials and services procurement.
Decommissioning and Rehabilitation	
Electrical Infrastructure	Disassembly and removal of electrical collector lines, substations, and transmission infrastructure.
Wind Turbines	Disassembly and removal of wind turbine infrastructure and meteorological evaluation towers.
Hydrogen Generation Plant	Disassembly and removal of HGP, water supply and treatment, hydrogen storage, byproduct storage, and transfer infrastructure.
Hydrogenation Plant	Disassembly and removal of HP, and toluene/MCH tank transfer infrastructure.
Toluene and MCH Storage and Transfer	Disassembly and removal of toluene/MCH storage and transfer infrastructure.
Administration Buildings	Disassembly and removal of O&M buildings and infrastructure.
Terrain Reclamation	Reclamation of disturbed areas.
Temporary Workforce Accommodations	Disassembly and removal of temporary workforce accommodations.
Employment and Expenditures	Direct and indirect spending on employment and goods/materials and services procurement
Accidents and Malfunctions	
Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials	Accidental spills and releases of hydrogen, toluene, MCH and other hazardous materials on land, in air or water.
Flaring /Venting of Hydrogen and Other Gases	Flaring or venting of hydrogen or other gases in the event of an emergency.
Traffic Incidents	Any Project-related vehicle collision or loss of control on land or in water with potential for injury to personnel, wildlife, and damage to infrastructure.
Fires and Explosions	Any incident involving a fire and/or explosion (other than from hydrogen).
Dislodging of a Wind Tower or Wind Turbine Blade	Unintended dislodging of a wind tower or wind turbine blade.
Ice Throw	Projection (ice throw) or drop (ice fall) of ice from wind turbine blades or tower structure.
Occupational Hazards and Human Injuries	Any event that presents a hazard or risk in which physical harm or damage may be inflicted upon a person.
Failure of Industrial Water Supply	Failure of industrial water supply to meet processing quality resulting in the shut-down of the electrolyzers until the issue can be rectified. Mechanisms of water supply failure may include unavailability of water or due to a spill, algal bloom, or water quality degradation (e.g., altered pH). Failure of water management infrastructure, such as pipeline leaks and culvert failure, may result in the loss of process water supply or an unplanned release to the surrounding environment.
Wildlife Emergencies/Incidents	Any threatened or actual harm to Project personnel or damage to Project infrastructure, resulting from interactions with wildlife.

4.1.6 Mitigation Measures

Along with compliance to regulations, a variety of standards, guidelines and mitigation measures were proposed to avoid, reduce, or compensate for potential adverse effects of Project-related activities. These ranged from standard industry best management practices for construction and operation, to policies and practices communicated through training programs, management plans, and/or engineering controls incorporated into the final Project design. Various mitigation measures were proactively incorporated into Project design to eliminate, reduce, and/or control the effects of Project-related activities on the environment. Project-specific mitigation and management measures are listed in Section 4.5 for ease of reference. The implementation of these mitigation measures was incorporated into the evaluation and rating of effects predictions.

4.1.7 Effects Predictions

The potential for an effect was determined based on the following tools and criteria:

- The location and duration of the interaction;
- The identification of any pathways between Project activities and the receiving environment;
- Results of predictive modelling and analyses;
- Existing literature on similar interactions and associated effects (including previous environmental assessments);
- Consultation with experts; and
- Results of monitoring exercises of similar projects.

To focus the assessment on key issues and substantive environmental effects, interactions with minimal or incidental potential effects were disregarded.

All predictions were accompanied by documentation of any scientific uncertainty related to the data and methods used to predict potential effects. All effects predictions were premised on the implementation of mitigation measures that have been proven effective in similar situations and are often mandatory or standard practice. Residual effects were those predicted to remain even after the implementation of proven mitigation measures or standard practices.

The characterization of residual effects included magnitude, geographic extent, duration, frequency and reversibility. Tables 4.1-3 (biophysical) and 4.1-4 (socio-economic) provide descriptions of effects characteristics and their contribution to determining the significance of an effect.

The assessment also incorporated the ecological and/or social context for each prediction, reflecting the importance of the subject attribute or feature to ecosystem health and function, as well as the influence of past and current human activities and associated disturbance.

Table 4.1-3 Residual biophysical effects assessment evaluation criteria.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Negligible – not detectable
	2	Low – within the range of natural variability and affects less than 10% of individuals/receptors in an affected area
	3	Moderate – affects 10 to 25% of individuals/receptors in an affected area
	4	High – affects between 25 and 50% of individuals/receptors in an affected area
	5	Very high – affects greater than 50% of individuals/receptors in an affected area
Frequency	1	Single event – residual effect occurs once
	2	Infrequent, irregular events – residual effects occur rarely but more than once
	3	Multiple irregular events – residual effects occur irregularly but more than once
	4	Multiple regular events – residual effects occur regularly
	5	Continuous – residual effects are continuous
Geographic Extent	1	Spatial extent of residual effect(s) is isolated to brownfield sites inside the PA
	2	Spatial extent of residual effect(s) is limited to the PA
	3	Spatial extent of residual effect(s) is limited to the local assessment area (LAA)
	4	Spatial extent of residual effect(s) is limited to the regional assessment area (RAA)
	5	Spatial extent of residual effect(s) is beyond the RAA
Duration	1	Effect lasts one day or less
	2	Effect lasts one to seven days
	3	Effect lasts one to four weeks
	4	Effect lasts one to 12 months
	5	Effect lasts more than one year
Reversibility	1	Highly reversible – likely to be reversed following end of Project phase or following Project closure
	2	N/A
	3	Partially reversible following end of Project phase or following Project closure
	4	N/A
	5	Irreversible – likely permanent following end of Project phase or following Project closure
Context	1	Brownfield site
	2	N/A
	3	Evidence of utilization but with natural features
	4	N/A
	5	Relatively pristine area

Table 4.1-4 Residual socio-economic effects assessment evaluation criteria.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Low – no perceptible impact on the integrity and/or quality of VC or its use by people
	2	N/A
	3	Moderate – integrity and/or quality of VC or its use by people is affected but not compromised
	4	N/A
	5	High – integrity and/or quality of VC or its use by people is compromised
Frequency	1	Single event – residual effect occurs once
	2	Infrequent, irregular events – residual effects occur rarely but more than once
	3	Multiple irregular events – residual effects occur irregularly but more than once
	4	Multiple regular events – residual effects occur regularly
	5	Continuous – residual effects are continuous
Geographic Extent	1	Limited to PA
	2	N/A
	3	Limited to LAA
	4	N/A
	5	Limited to RAA
Duration	1	Effect lasts one day or less
	2	Effect lasts one to seven days
	3	Effect lasts one to four weeks
	4	Effect lasts one to 12 months
	5	Effect lasts more than one year
Reversibility	1	Highly reversible – likely to be reversed following end of Project phase or closure
	2	N/A
	3	Partially reversible following end of Project phase or closure
	4	N/A
	5	Irreversible – likely permanent following end of Project phase or closure
Context	1	Low – not identified by regulators, Rights Holders or stakeholders as a Project-related issue
	2	N/A
	3	Medium – identified by regulators or stakeholders as an important issue to be addressed/resolved
	4	N/A
	5	High – has regulatory protection

The outcome of the effects assessment was the identification of interactions that result in significant negative residual effects. For each assessment, the determination was based on standards or thresholds assigned to each KI. Rationale for the threshold determination and the residual effects characterization has been provided in each VC section of Section 4.2.

Residual effects significance criteria were determined for each assessment based on such factors as:

- Review of applicable regulations, environmental standards, guidelines and/or objectives;
- Consultation with appropriate regulatory agencies;
- Information obtained in stakeholder or Rightsholder consultation;
- Available information on the status and characteristics of each VC; and
- Results from monitoring of other projects.

Significance criteria were defined quantitatively where possible, and qualitatively with supporting justifications where no standards existed. Significance criteria for each KI were defined in the corresponding VC section, and thresholds were based on the study team's expertise and experience.

A summary was prepared for each VC, in Section 5, to identify and describe remaining residual effects following compliance and mitigation, as presented in Tables 4.1-5 and 4.1-6. Section 5 also provides a description of any gaps or limitations that reduced the level of confidence in predictions.

Table 4.1-5 Summary of residual effects on the Biophysical VC sample table.

Project Phase	KI	Nature of Effect	Effect Criteria					
			Magnitude	Frequency	Geographic Extent	Duration	Reversibility	Context
Construction		P – Positive N – Negative	1 – Negligible	1 – Single	1 – Brownfield	1 – <1 day	1 – Highly Reversible 3 – Partially Reversible 5 – Irreversible	1 – Brownfield 3 – Evidence of Utilization 5 – Relatively Pristine
Operation and Maintenance			2 – Low	2 – Infrequent	Site in PA	2 – 1 to 7 days		
Decommissioning and Rehabilitation			3 – Moderate	3 - Multiple	2 – PA	3 – 1 to 4 weeks		
Accidents and Malfunctions			4 – High	4 – Multiple	3 – LAA	4 – 1 to 12 months		
			5 – Very High	5 – Continuous	5 – Beyond RAA	5 – >1 year		

Table 4.1-6 Summary of residual effects on the Socio-Economic VC sample table.

Project Phase	KI	Nature of Effect	Effect Criteria					
			Magnitude	Frequency	Geographic Extent	Duration	Reversibility	Context
Construction		P – Positive N – Negative	1 – Low 3 – Moderate 5 – High	1 – Single	1 – PA 3 – LAA 5 – RAA	1 – <1 day 2 – 1 to 7 days 3 – 1 to 4 weeks 4 – 1 to 12 months 5 – >1 year	1 – Highly Reversible 3 – Partially Reversible 5 – Irreversible	1 – Low 3 – Medium 5 – High
Operation and Maintenance				2 – Infrequent				
Decommissioning and Rehabilitation				3 - Multiple				
Accidents and Malfunctions				4 – Multiple				
				5 – Continuous				

4.1.8 Monitoring and Follow Up

Monitoring programs have been identified and are to be implemented both as good practice and in compliance with permits and approvals as required. Additionally, a program of environmental effects monitoring was identified to confirm predictions and assess the effectiveness of mitigation measures. Details on the specific monitoring required for each VC were based on the potential effects identified. Proposed monitoring and follow-up plans for the Project are described in Section 4.6, with select plans provided in the Appendices.

4.2 Predicted Environmental Effects of the Undertaking

This section evaluates potential environmental effects during construction, operations, decommissioning and rehabilitation, and examines the potential from accidents and malfunctions. It identifies areas of environmental sensitivity such as SAR habitats, wetlands, and culturally significant lands, and outlines mitigation strategies designed to avoid or reduce adverse effects. These strategies may include careful site selection, timing restrictions to protect migratory species, dust and noise control measures, water management plans, and post-construction monitoring. All measures were developed in accordance with federal and provincial environmental regulations and aim to ensure that North Atlantic advances NL's climate goals without compromising local ecological integrity or community well-being.

4.2.1 Atmospheric Environment

The atmospheric environment is an important component of environmental effects assessments for wind-to-hydrogen developments. There are five atmospheric considerations through which the Project could interact, including: air quality, noise, vibration, light, and greenhouse gases. Construction activities have the potential to generate dust and emissions from equipment, as well as vibrations from activities such as blasting and vehicular traffic, while operational interactions can include noise from wind turbines, compressors, or electrolyzers, as well as localized oxygen or thermal emissions.

4.2.1.1 Scope, Measurable Parameters, and Definition of Significant Effects

Five Key Indicators (KIs) were selected through which the Atmospheric Environment VC and the Project interact: air quality, GHGs, light, noise (sound quality), and vibration. Climate change is not directly considered a key indicator; however, GHG can be used as a proxy to illustrate potential interactions with climate change. Emitted GHGs trap and absorb heat, resulting in the greenhouse effect, which is the main driver of climate change.

In general, Project activities across all phases will generate emissions to the atmospheric environment. Such emissions may have adverse effects on vegetation, wildlife and wildlife habitat, human health and wellbeing, and visual aesthetic of the PA. Table 4.2.1-1 lists applicable measurable parameters of each KI, as well as the geographic scope covered in this assessment.

Table 4.2.1-1 Scope and Measurable Parameters of Key Indicators: Atmospheric Environment.

Key Indicator	Scope	Measurable Parameter(s)
Air Quality	RAA	Ambient ground-level concentrations of air contaminants ($\mu\text{g}/\text{m}^3$).
GHGs	RAA	Emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxygen (N_2O) in tonnes (t) of carbon dioxide equivalents (CO_2e) annually.
Light	LAA	Levels of light illuminance (lux).
Noise	LAA	Sound pressure levels measured in A-weighted decibels (dBA); change in percent highly annoyed ($\Delta\% \text{HA}$).
Vibration	PA	Proximity of sensitive receptors to Project-related sources of vibration (km).

The air quality assessment examined substances potentially emitted by the Project, specifically those subject to applicable air quality objectives and standards established by the NL DECC and/or ECCC. The predicted effects (i.e., ground-level concentrations of criteria air contaminants) were compared to the NL Air Quality Standards (NL AQS), as per Schedule A of the Air Pollution Control Regulations, 2022, as the compliance standard. Air contaminants concentrations considered in the assessment included: carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxides (NO_2), total suspended particulate (TSP), particulate matter less than 10 microns (PM_{10}), and particulate matter less than 2.5 microns ($\text{PM}_{2.5}$). Other air contaminants such as hydrogen sulphide, asbestos, metals, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (dioxins) and polychlorinated dibenzo furans, are also regulated provincially. However, none of the Project activities are expected to result in a release of these contaminants. Therefore, they were not considered further.

GHG emissions are quantified in tonnes (t) of carbon dioxide equivalent (CO_2e). The methodology for calculating CO_2e is outlined in Appendix H1. The GHG assessment accounted for emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) associated with Project activities. GHGs also include perfluorocarbons (PFC), hydrofluorocarbons (HFC), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). These gases are not expected to be released by the Project in appreciable or detectable quantities and were not considered further. Monitoring and reporting of GHGs will be conducted during the O&M Phase of the Project, in accordance with applicable provincial and federal GHG quantification and reporting requirements.

At present, there are no regulations in NL governing obtrusive light from industrial facilities. However, the Institution of Lighting Engineers (ILE) has published guidelines which have been referenced and applied in this assessment. Light levels, measured in lux, at the nearest receptors were considered accordingly in the effects assessment for this Project.

A study was completed to assess the potential effects of noise and vibration from the Project on the surrounding environment, specifically sensitive receptors (i.e., human receptors – seasonal and permanent dwellings) closest to the PA, representing the worst-case scenario for noise and vibration disturbance. The results were calculated as percent highly annoyed (%HA (i.e., noise levels at which people report strong disturbance, stress, or interference with daily life. In the absence of provincial regulations or guidelines for exposure limits for vibration in NL, guidelines related to public nuisance from vibration developed by the American National Standards Institute (ANSI) and the Acoustical Society of America (ASA) through ANSI/ASA S.39-1983 were applied. The guidelines have been adopted by regulatory agencies such as the United States Federal Transit Administration (US FTA) and are often used in jurisdictions across Canada for assessing vibration. Predicted Project vibrations in mm/s root-mean-square (RMS) were compared to the ANSI and ASA guidelines for this Project.

The assessment criteria used to determine the effects of the Project on the Atmospheric Environment VC can be found in Table 4.1.3 of Section 4.1.7 above. For the Atmospheric Environment VC, the definition of a significant adverse residual effect was tailored according to each KI as follows:

- Air Quality – Project emissions of airborne contaminants are predicted to alter ambient air quality to the extent that the modelled concentrations, when combined with background levels, surpass applicable regulatory standards (i.e., high level of magnitude). Concern due to the predicted geographical extent (i.e., beyond the PA) and frequency (i.e., regularly or continuously) of the exceedances, as well as the proximity of sensitive receptors to Project infrastructure (i.e., contextual relevance), also influence the consideration of significance.
- GHGs – The Project GHG emissions are predicted to account for more than 25% of provincial emission totals (i.e., magnitude of emissions is high), and do not constitute measurable progress in the context of achieving established GHG reduction targets for 2030 and 2050. Additionally, the Project's contribution to global GHG emissions will be considered, including the anticipated reduction of downstream (Scope 3) emissions through the displacement of fossil fuels with green hydrogen produced by the Project.
- Light – Light emissions from the Project are predicted to surpass ILE guidelines for illuminance levels as compared to ambient light levels at sensitive receptors (i.e., the nearest residential receptors to Project infrastructure).
- Noise – Noise emissions from the Project are predicted to surpass the Health Canada guidelines for annoyance (i.e., the maximum change in percentage of the exposed population that would be annoyed ($\Delta\%HA$)), sleep disturbance (i.e., the indoor nighttime noise level limit at sensitive locations), or low frequency noise (i.e., the difference between A- and C-weighted sound pressure levels). An adverse residual effect was considered significant if the threshold of regular or

continuous frequency was predicted to be exceeded beyond the PA at sensitive receptors (i.e., the nearest human receptors – seasonal and permanent dwellings – to Project infrastructure).

- Vibration – Project-related vibration levels are predicted to surpass nuisance guidelines established by the ANSI / ASA at sensitive receptors (i.e., the nearest human receptors – seasonal and permanent dwellings – to Project infrastructure).

4.2.1.2 Baseline Conditions

Sections 4.1.1 and 4.2.1 provide an overview of the current understanding of the baseline conditions of the five KIs – air quality, GHGs, light, noise, and vibration, with supporting documentation presented in:

- Appendix A – Atmospheric Environment Component Study, which includes desktop analyses and field studies to evaluate the existing air quality and noise conditions;
- Appendix H2 – Air Dispersion Modelling Study, which evaluates the impacts of pollutant emissions on air quality;
- Appendix I – Light Impact Assessment, which predicts the potential impacts of the proposed lighting installations on sensitive receptors;
- Appendix J – Noise and Vibration Impact Study, which evaluates the potential noise and vibration impacts on sensitive receptors.; and
- [EPR Appendix 5 – Additional Information Related to the Air Dispersion Modelling Assessment.](#)

Air Quality

Baseline air quality conditions were evaluated using a combination of desktop analyses and field studies. The desktop assessment evaluated a variety of air contaminants including PM₁₀, PM_{2.5}, NO, NO₂, CO, SO₂, and O₃ within the RAA between 2020 and 2023. The study indicates that there is minimal regional variation in air quality as contaminant concentrations reported from the Mount Pearl NAPS station, located 130 km east of the PA, were largely comparable to measured concentrations in the vicinity of the PA. A supplemental baseline field survey was conducted at three locations assumed to be indicative of those across the broader RAA. Field study measured PM₁₀, TSP, metals, and NO₂ in an effort to provide a more comprehensive evaluation of air quality conditions in relation to potential emissions from the operations at Braya by supplementing their IMN ambient air quality monitoring stations. The results of the baseline study (Appendix A) revealed that the ambient air quality within the study area generally met established air quality standards.

Greenhouse Gas Emissions

Several facilities within the PA (i.e., Braya Refinery) and the RAA (i.e., Long Harbour Processing Plant, NARL Logistics Terminal and the Newfoundland Transshipment Terminal) contribute to GHG emissions through their operations. However, only the Braya Refinery and Long Harbour Processing Plant report GHG emissions to the NL DECC under the **Management of Greenhouse Gas Act, 2016**.

Light

A light assessment was conducted to analyze the proposed lighting installation for the Project. Findings from the assessment were compared with the guidelines published by the ILE in the document entitled, "Guidance Notes for the Reduction of Obtrusive Light". According to the Environmental Zone Classification system developed by the ILE, the classification for rural areas, small villages, or relatively dark urban locations is "E2 Low district brightness areas". No field data was collected as part of this assessment. The areas surrounding the wind turbines are predominantly rocky and barren, offering minimal obstruction to light. In contrast, the HGP and HP PA is characterized by woodland, ponds, and wetlands. These features, along with topographic variation in the landscape, contribute to a substantial reduction in light transmission beyond the Project footprint.

Noise

Ambient noise levels were measured at six locations within the RAA in January, February, and August 2024. Noise levels were continuously collected over a period of two to six days at each location. The two locations in proximity to the Come By Chance Industrial Site (N2- Come by Chance and N5- Arnolds Cove) exhibited the highest levels of noise, characteristic of urban residential environments, while locations N1 (Rantem), N3 (Upshall), and N6 (Sunnyside) reported low ambient noise levels characteristic of a rural setting with minimal anthropogenic inclusions. The closest baseline noise monitoring station to the proposed Wind Farm is in Sunnyside. All other baseline noise monitoring stations are located to the south of the PA.

Vibration

Ambient vibration levels in the PA are generally low, with intermittent vibrations resulting from construction and industrial activities in the region, particularly from Braya operations. Further assessment of baseline vibration levels was not conducted due to the siting of Project infrastructure at distance from any potential sensitive receptors.

4.2.1.3 Project-Environment Interactions

Potential interactions with the identified KIs of the Atmospheric Environment VC are summarized in Table 4.2.1-2. As illustrated, there will be several interactions between the Project and KIs of the Atmospheric Environment VC.

Table 4.2.1-2 Potential Project interactions with atmospheric environment.

Project Component and Activity Description	Key Indicators: Atmospheric Environment				
	Air Quality	GHGs	Light	Noise	Vibration
Construction					
Site Preparation	X	X	X	X	X
Roads	X	X	X	X	X
Staging and Laydown	X	X	X	X	X
Temporary Batch Plant	X	X	X	X	X
Equipment and Materials Transport	X	X	X	X	X
Wind Turbine Foundations	X	X	X	X	X
Electrical Infrastructure	X	X	X	X	X
Wind Turbine Installation	X	X	X	X	X
Hydrogen Generation Plant	X	X	X	X	X
Hydrogenation Plant	X	X	X	X	X
Toluene and MCH Storage and Transfer	X	X	X	X	X
Flare Stacks	X	X	X	X	X
Administration Buildings	X	X	X	X	X
Temporary Workforce Accommodations	X	X	X	X	X
Employment and Expenditures					
Operation and Maintenance					
Wind Turbine Operation			X	X	X
Wind Turbine Maintenance			X	X	X
Electrical Infrastructure			X	X	
Venting and Flaring	X	X	X	X	
Road Maintenance	X	X	X	X	
Hydrogen Generation Plant	X	X	X	X	
Hydrogenation Plant	X	X	X	X	
Toluene and MCH Storage and Transfer	X	X	X	X	
Administration Buildings	X	X	X	X	
Employment and Expenditures					
Decommissioning and Rehabilitation					
Electrical Infrastructure	X	X	X	X	X
Wind Turbines	X	X	X	X	X
Hydrogen Generation Plant	X	X	X	X	X

Project Component and Activity Description	Key Indicators: Atmospheric Environment				
	Air Quality	GHGs	Light	Noise	Vibration
Hydrogenation Plant	X	X	X	X	X
Toluene and MCH Storage and Transfer	X	X	X	X	X
Terrain Reclamation	X	X	X	X	X
Temporary Workforce Accommodations	X	X	X	X	X
Administration Buildings	X	X	X	X	X
Employment and Expenditures					
Accidents and Malfunctions					
Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials	X	X			
Flaring /Venting of Hydrogen and Other Gases	X	X	X	X	X
Traffic Incidents	X	X	X	X	X
Fires and Explosions	X	X	X	X	X
Dislodging of a Wind Tower or Wind Turbine Blade				X	X
Ice Throw				X	X
Occupational Hazards and Human Injuries					
Failure of Industrial Water Supply					
Wildlife Emergencies/Incidents					
<u>Notes</u> X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the KI are not expected.					

Air Quality

Throughout the Construction Phase, various activities will contribute to the release of air contaminants, primarily due to the use of fossil fuel-fired equipment (mobile and stationary). Additional emissions of air contaminants will be generated because of blasting, vehicular traffic on unpaved roads, wind erosion of exposed surfaces (e.g., stockpiles, laydown areas), material handling, and Project component transport. During the O&M Phase, airborne releases will arise from flaring systems (primary and backup), cooling towers, marine transport operations, and backup power generation.

Additional air emission activities during the Construction Phase are expected to generate fugitive dust, which can be carried by wind and dispersed over surrounding areas, potentially affecting nearby sensitive environments. These emissions may arise from nearly all construction-related activities including material handling and vehicle movement on unpaved surfaces. Their dispersion is influenced by several factors, such as wind speed and direction, surface dryness, and the absence of natural ground cover or vegetation. If not properly managed, fugitive dust can degrade local air quality, pose health risks to workers and nearby communities, and contribute to the deposition of particulate matter on ecologically sensitive areas. However, unlike emissions from the O&M Phase, those from the Construction Phase are

temporary in nature. Additionally, mitigation measures are planned to minimize these interactions and are detailed in Section 4.5.1.

An Air Dispersion Modelling Study (Appendix H2) was completed to evaluate the geographic scope and magnitude of the potential air emissions by the Project during the O&M Phase, and to assess the potential effect on air quality based on relevant provincial regulations. The air dispersion modelling approach considered inputs such as emission rates, source locations, sensitive receptor locations, and results. Modelled concentrations for each air contaminant were combined with background concentrations and compared against NL AQS. Dispersion modelling used background concentrations developed in the Atmospheric Environment Baseline Study (Appendix A). A summary of the atmospheric dispersion modelling results is presented in Table 4.2.1-3 and results from model re-evaluation are provided in EPR Appendix 5 Table 3. Atmospheric discharge rates (otherwise known as emission rates) used in the CALPUFF dispersion modelling system are provided in Table 4.2.1-4 and results from model re-evaluation are provided in EPR Appendix 5 Table 2. Emission rates were conservatively estimated using the maximum expected values for all sources operating under normal conditions. These "worst-case" emissions were applied in combination with worst-case meteorological conditions throughout the entire modelling period to ensure that the maximum potential effect was captured. The same conservative emission assumptions were also applied in estimating annual average concentrations.

Results of the original modelling performed indicated that no exceedances of regulatory air quality objectives (i.e., NL AQS) are predicted at and around identified sensitive receptors (i.e., cabins and residences). However, isolated exceedances of select modelled parameters (PM₁₀, PM_{2.5} and NO₂) are predicted to occur infrequently near the PA with limited to no public access. Results from model re-evaluation with more detailed inputs are provided in EPR Appendix 5 and demonstrate that no exceedances of the NL Air Pollution Control Regulations are expected for PM₁₀ or PM_{2.5}.

A summary of air pollutant annual and daily atmospheric discharges estimates for the O&M Phase is provided in Table 4.2.1-5, with estimated daily and annual emission rates for cooling tower to be reduced based on model re-evaluation provided in EPR Appendix 5.

Table 4.2.1-3 Air dispersion modelling results summary.

Contaminant	CAS No.	Total Facility Emission Rate	Maximum Modelled GLC	Averaging Period	Percentile (1) (2)	Background Concentration (3) (4) (5)	Maximum Total GLC	Limit	Percentage of POI Limit
		(g s ⁻¹)	(µg m ⁻³)		(nth)	(µg m ⁻³)	(µg m ⁻³)	(µg m ⁻³)	
Carbon monoxide	630-08-0	1.41E+00	54.29	1-hr	Maximum	322.00	376.29	35,000	1.1%
		1.41E+00	34.01	8-hr	Maximum	253.00	287.01	15,000	1.9%
Nitrogen dioxide	10102-44-0	9.66E+00	529.59	1-hr	Maximum	30.08	559.67	400	139.9%
		9.66E+00	247.75	24-hr	Maximum	22.56	270.31	200	135.2%
		9.66E+00	22.17	Annual	Maximum	1.88	24.05	23	109.3%
Particulate matter <= 2.5 microns (PM _{2.5})	-	2.60E+00	33.99	24-hr	Maximum	16.00	49.99	25	200.0%*
		2.60E+00	1.72	Annual	Maximum	5.00	6.72	8.8	76.4%*
Particulate matter <= 10 microns (PM ₁₀)	-	2.60E+00	33.99	24-hr	Maximum	28.00	61.99	50	124.0%*
Total suspended particulate matter (TSP)	-	2.60E+00	33.99	24-hr	Maximum	33.57	67.57	120	56.3%
		2.60E+00	1.72	Annual	Maximum	12.45	14.18	60	23.6%
Sulphur dioxide	7446-09-5	3.05E-02	1.71	1-hr	Maximum	12.05	13.77	171	8.1%
		3.05E-02	1.47	3-hr	Maximum	0.79	2.25	600	<1%
		3.05E-02	0.82	24-hr	Maximum	5.76	6.58	300	2.2%
		3.05E-02	0.13	Annual	Maximum	0.79	0.91	11	9.1%

Notes

*Percentage of POI Limit updated based on model re-evaluation provided in EPR Appendix 5 Table 3.

- (1) For all averaging periods, the worst-case modelling result was considered without adjusting for any meteorological anomalies. Due to the unavailability of onsite source information, this approach, along with the use of conservative source assumptions, was employed to capture the maximum possible worst-case impact.
- (2) For the Annual average periods, the modelling results are based on the worst-case result of each year within the 3-year modelling period.
- (3) Based on continuous monitoring data from the Mount Pearl NAPS Station from January 1, 2020, to December 31, 2022
- (4) Background concentrations are calculated as follows:
 For hourly values, the maximum hourly concentration observed outside the Project fence line
 For 3-hour values, the 3-hour rolling average of 90th percentile hourly concentrations
 For 24-hour values, the maximum 24-hour average
 For annual values, the maximum annual average
- (5) TSP is not monitored at the Mount Pearl NAPS Station. Background concentrations of TSP were estimated using the background concentrations of PM₁₀ and the average ratio of PM₁₀ to TSP observed during the field study (0.834).

Table 4.2.1-4 Atmospheric discharge rates: Project Operation.

Source	Maximum TSP Emission Rate	Maximum PM ₁₀ Emission Rate	Maximum PM _{2.5} Emission Rate	Maximum SO ₂ Emission Rate	Maximum NO ₂ Emission Rate	Maximum CO Emission Rate
	(g s ⁻¹)	(g s ⁻¹)	(g s ⁻¹)	(g s ⁻¹)	(g s ⁻¹)	(g s ⁻¹)
Flare	0.087	0.087	0.087		0.055	0.422
Cooling Tower	0.384	0.384*	0.384*			
Tanker	0.517	0.517	0.517		0.881	
Tugboat	0.038	0.038	0.038		0.076	
Emergency Generator	0.100	0.100	0.100	0.094	1.422	0.306

Notes
 *Maximum PM₁₀ and PM_{2.5} Emission Rates for Cooling Tower updated based on model re-evaluation provided in EPR Appendix 5 Table 2.

Table 4.2.1-5 Estimated daily and annual emission rates by source.

Source ID	Equipment Name	CO Emission Rate ⁽¹⁾		NO ₂ Emission Rate		PM _{2.5} Emission Rate		PM ₁₀ Emission Rate		TSP Emission Rate		SO ₂ Emission Rate	
		⁽²⁾		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}	
		(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)
SC-01	Emergency Generator ⁽³⁾	26.466	110.277	122.860	511.918	8.636	35.985	8.636	35.985	8.636	35.985	8.079	33.664
FLR-01	LOHC Flare	36.429	13,296.633	4.795	1,750.008	7.526	2,746.863	7.526	2,746.863	7.526	2,746.863		
FLR-02	Braya Flare ⁽³⁾	36.429	151.788	4.795	19.977	7.526	31.357	7.526	31.357	7.526	31.357		
CT-01*	Cooling Tower Cell 1					33.164	12,104.764	33.164	12,104.764	33.164	12,104.764		
CT-02*	Cooling Tower Cell 2					33.164	12,104.764	33.164	12,104.764	33.164	12,104.764		
CT-03*	Cooling Tower Cell 3					33.164	12,104.764	33.164	12,104.764	33.164	12,104.764		
CT-04*	Cooling Tower Cell 4					33.164	12,104.764	33.164	12,104.764	33.164	12,104.764		

Source ID	Equipment Name	CO Emission Rate ⁽¹⁾		NO ₂ Emission Rate		PM _{2.5} Emission Rate		PM ₁₀ Emission Rate		TSP Emission Rate		SO ₂ Emission Rate	
		⁽²⁾		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}		^{(1) (2)}	
		(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)	(kg d ⁻¹)	(kg yr ⁻¹)
CT-05*	Cooling Tower Cell 5					33.164	12,104.764	33.164	12,104.764	33.164	12,104.764		
OGV-01	Ocean-going MCH tanker ⁽⁴⁾	69.202	2,491.288	76.123	2,740.417	44.694	1,608.968	44.694	1,608.968	44.694	1,608.968	2.173	78.226
TUG-01	Tugboat 1 ⁽⁴⁾	8.165	293.933	6.532	235.146	3.266	117.573	3.266	117.573	3.266	117.573	0.232	8.348
TUG-02	Tugboat 2 ⁽⁴⁾	8.165	293.933	6.532	235.146	3.266	117.573	3.266	117.573	3.266	117.573	0.232	8.348
TOTAL	Total	184.857	16,637.851	221.636	5,492.612	240.732	65,182.141	240.732	65,182.141	240.732	65,182.141	10.716	128.585

Notes

*Estimated daily and annual emission rates for cooling tower to be reduced based on model re-evaluation provided in [EPR Appendix 5](#).

(1) Based on the assumptions and calculation methodologies described in Appendix H2 - Air Dispersion Modelling Study.

(2) Daily emissions represent the daily maximum, while annual emissions represent the annual estimated under standard operating conditions.

(3) Based on a maximum annual operating time of 100 hours.

(4) Based on a maximum annual operating time of 864 hours, estimated using a given maximum movement of 18, and an estimate of 48 operating hours per movement.

The Construction and Decommissioning and Rehabilitation Phases were excluded from the air dispersion modelling due to the nature of activities in both Phases. Specifically, emission sources have significant temporal variation, with no permanent or long-term effects on air quality expected, and source parameters, including specific locations, are unknown. Airborne releases were also not estimated (quantified) for Accidents and Malfunctions based on the same logic. Project activities associated with Construction and Decommissioning and Rehabilitation Phases are anticipated to be lower than during Operation. Accidents and malfunctions (e.g., flaring, fire and explosion) have the potential to generate airborne releases, resulting in an effect on air quality but over a short duration and at levels lower than those generated during other Project phases.

Greenhouse Gas Emissions

Project activities during the Construction, O&M, and Decommissioning and Rehabilitation Phases will generate GHG emissions. The magnitude of Project-related GHG emissions will be driven by fossil fuel consumption. During the Construction Phase, Scope 1 (direct) emissions will be released from blasting and fossil fuel consumption in mobile and stationary combustion equipment. Marine transport of supplies (e.g., nacelles, blades, towers) will generate Scope 3 (indirect) emissions during the Construction Phase. During the O&M Phase, Scope 1 (direct) emissions will be released from fossil fuel-powered mobile and stationary combustion equipment, as well as flaring at the HP. Indirect O&M emissions will arise from electricity consumption (Scope 2) and marine transport of MCH and toluene (Scope 3).

GHG emission estimates were developed for the Construction and O&M Phases using preliminary engineering details, publicly available emission factors, and good practice guidelines. Annual Construction and O&M Phase estimates are presented in Table 4.2.1-6. Calculation methodologies, inputs and assumptions are detailed in Appendix H1 (Emissions Inventory). O&M Phase emissions were calculated using inputs from the 30 ktpa production case except for emissions from flare stacks, which were calculated using inputs from the 60 ktpa LOHC production case. GHG emission estimates were not quantified for the Decommissioning and Rehabilitation Phase nor for unplanned events. It is assumed that GHG emissions during the Decommissioning and Rehabilitation Phase will not exceed GHG emission levels generated during the Construction Phase. Unplanned events (e.g., accidents, malfunctions) may generate GHG emissions, but at levels lower than those estimated during the Construction and O&M Phases.

GHG emissions estimated to be released during the Construction and O&M Phases are relatively low; emissions are not anticipated to result in measurable change to atmospheric levels of GHGs. During the O&M Phase, emissions are projected to account for less than 1% of provincial GHG emissions (Newfoundland and Labrador Department of Environment and Climate Change, 2023). GHG emission estimates for the O&M Phase are subject to change over the 30-year lifetime of the Project; the implementation of greener technologies (e.g., electric vehicles) may result in reduced GHG emissions.

Table 4.2.1-6 Annual GHG emissions estimate summary.

Phase	Source	Annual GHG Emissions (t CO ₂ e)			
		Scope 1 (Direct)	Scope 2 (Indirect)	Scope 3 (Other Indirect)	Total Scope 1 + Scope 2
Construction	Blasting	51			51
	Stationary Combustion	1,089			1,089
	Mobile Equipment	13,700			13,700
	Marine Transport of Supplies			83,341	0
	Total Annual Construction ^[1]	14,840	0	83,341	14,840
O&M	Mobile Equipment	98			98
	Flare Stacks	3,362			3,362
	Emergency Generator	19			19
	Marine Transport of Product			36,020	0
	Electricity Consumption ^[2]		5,465		5,465
	Total Annual Operation ^[3]	3,478	5,465	36,020	8,943

Notes
^[1] Project construction scheduled to occur over a two-year period, marine transport of supplies to occur in a single calendar year.
^[2] Accounts for firm and non-firm power requirements.
^[3] Operational lifetime of the Project is 30 years.

Light

Light was evaluated as part of the Atmospheric Environment VC due to the potential effects of Project lighting on nighttime sky visibility, migrating wildlife, and overall nuisance to sensitive receptors. Artificial lighting will be required for safe and efficient operation during all Project Phases. During Construction and Decommissioning Phases, Project lighting will be temporary; limited to mobile equipment (e.g., heavy equipment, light duty vehicles, mobile floodlights) and will be minimized to only what is necessary for safety when activity in a particular location is complete. During the O&M Phase, permanent Project lighting will be installed on buildings, wind turbines, and access roads. Due to the industrial nature of the NARL Logistics Terminal and thus the location of the HGP and HP, the proposed Project will have a limited effect on the ambient light levels in this area. The Wind Farm is sited in a more natural largely undeveloped area, and therefore it is more susceptible to potential interactions with ambient light levels. Accidents and Malfunctions, including flaring, fire / explosion, and traffic accidents, also have the potential to temporarily alter ambient light levels in the vicinity of the PA.

Project lighting design has not been finalized; thus, a qualitative assessment (Appendix I) was conducted in consideration of regulations, codes and guidance set forth by the ILE and Transport Canada, as required (The Institution of Lighting Engineers, 2005; Standard 621 - Obstruction Marking and Lighting - Canadian Aviation Regulations (SOR/96-433), 2021). Final Project lighting design will consider such regulations, codes, and guidance to negate generation of Project-related obtrusive lighting. Following decommissioning, ambient light levels are anticipated to return to pre-Project conditions.

The Light Impact Assessment (Appendix I) evaluated influence of Project lighting on sensitive receptors (i.e., the nearest residential receptors to Project infrastructure). As a conservative measure, it is assumed that 100% of incident light will reach sensitive receptors. However, the combination of uneven terrain and surrounding vegetation will markedly attenuate light before it reaches these sensitive receptors, especially at the location of the HGP and HP, which is characterized by woodland, ponds, and wetlands. Additionally, there will be greater lighting associated with equipment and structural components within the HGP and HP area compared to the Wind Farm area.

Total illuminance (the amount of light that covers a surface) for the O&M Phase is provided in Table 4.2.1-7. Calculations of total illuminance were performed for a scenario where all equipment is operated at the same time and at the closest sensitive receptor, and for pre- and post-curfew conditions (The Institution of Lighting Engineers, 2005). Methodology used to assess lighting effects on sensitive receptors is further detailed in Appendix I.

Table 4.2.1-7 Illuminance at Receptors: Project O&M.

Period	Illuminance (lux)		ILE Guidance Limit (lux)
	HGP and HP	Wind Farm	
Pre-curfew (7:00 – 22:59)	2.22E-01	4.56E-01	5
Post-curfew (23:00 – 06:59)	2.22E-01	4.56E-01	1
<u>Notes</u> ILE = Institution of Lighting Engineers			

Pre- and post-curfew illuminance represent 9.11% and 45.55% of guidance limits, respectively. For context, the post-curfew limit of 1 lux is the accepted equivalent to moonlight. Considering this, predicted light effects for the duration of Project O&M will be negligible, in comparison to pre-existing conditions.

Noise

The Project will generate noise emissions during all Project phases. Construction noise, while temporary, will be generated during activities such as earthmoving, blasting, installation of electrical infrastructure (e.g., transmission line), and operation of mobile equipment. The Project will generate substantial noise emissions during the O&M Phase, primarily resulting from wind turbine operation; noise emissions from wind turbines generally increase with wind speed. HP and HGP infrastructure (e.g., compressors, generators, flares) will also generate noise emissions during Project operation. Operational noise-generating infrastructure may affect noise levels in the LAA, particularly at locations proximate to identified sensitive receptors. Noise generated during decommissioning and rehabilitation activities is anticipated to be less than that of other Project Phases and will be temporary. Ambient noise levels are anticipated to return to pre-Project conditions after decommissioning and rehabilitation activities are

complete. Potential noise resulting from Accidents and Malfunctions will be temporary and localized to the location of the unplanned activity (i.e., traffic accident, fire or explosion).

A conservative approach was used to evaluate O&M Phase noise emissions in the Noise and Vibration Impact Study (Appendix J); it was assumed that the wind turbines will operate at the maximum wind speed at the Wind Farm, while it was assumed that all infrastructure at the HGP and HP will operate outdoors with enclosure reduction applied to select equipment. The percent highly annoyed (%HA) is a measurable parameter that was assessed in the study, as well as indoor nighttime noise and low frequency noise (LFN). The %HA is the percentage of the exposed population that would be annoyed by a particular day-night average sound pressure level (L_{dn}). LFN is noise with frequency content in the range of 16 to 200 hertz (Hz). The %HA was assessed for two Project construction scenarios: (1) wind turbine, HGP, and HP construction; and (2) transmission line, collector system and road construction. Additionally, %HA was assessed for Project O&M. Indoor nighttime noise and LFN were assessed for Project O&M only (i.e., Construction and Decommissioning and Rehabilitation were not considered). The study considered receptors with the greatest potential exposure to noise sources due to proximity and direct line of sight exposure. Receptor locations were selected in areas where people normally live, work, and take part in recreational activities; it did not consider the Project workforce. While many more receptor locations exist in the LAA, selected receptor locations are assumed to be representative of Project interactions. Results of the %HA assessment (Appendix J) are summarized in Table 4.2.1-8.

Table 4.2.1-8 Noise Impact Study Results: %HA Assessment.

Project Component	Baseline		Project Predicted L_{dn} (dBA)	Total (Baseline plus Project)		Δ %HA (Between Total and Baseline)
	L_{dn} (dBA)	%HA		L_{dn} (dBA)	%HA	
Construction Scenario 1 ^[1]	50 - 61	2.1 - 8.9	16 - 55	50 - 61	2.1 - 8.9	0.0 – 2.1
Construction Scenario 2 ^[2]			15 - 57	50 - 61	2.1 - 8.9	0.0 - 3.1
Operation and Maintenance			26 - 51	50 - 62	2.1 – 9.3	0.0 – 0.6
Notes Δ %HA = change in %HA between total and baseline L_{dn} data presented with the +10 dB correction for rural areas in accordance with Health Canada ^[1] Construction of wind turbines, HGP and HP ^[2] Construction of transmission line, collector system and road						

Health Canada recommends that the maximum change in %HA due to Project activities be no more than 6.5% (Health Canada, 2017). Per Table 4.2.1-8, the change in %HA level is below 6.5% for all PORs. As such construction noise impacts are not anticipated during both Construction Scenario 1 (wind turbine, HGP and HP construction activities) and Construction Scenario 2 (transmission lines, collector system and road construction activities). During the O&M Phase, %HA at all receptors were predicted to comply with limits set forth by Health Canada. Therefore, provided that select operational equipment is tendered with low noise options or mitigated appropriately, predicted noise levels produced by worst-case activities during the Construction, and O&M Phases of the Project are predicted to be within the applicable limits.

In addition to the %HA assessment, an indoor nighttime noise assessment was conducted for the Project O&M Phase. As a conservative measure, 15 dBA was subtracted from outdoor Project noise at the plane of the dwelling window of receptors to obtain predicted indoor noise levels (Health Canada, 2017). The 15 dBA metric considers an outdoor-to-indoor transmission loss with windows at least partially open. Per Health Canada guidance, outdoor sound level targets for sleep disturbance are 45 and 57 dBA for partially open and fully closed windows, respectively. As a conservative measure, the sleep disturbance target was set to 45 dBA. The predicted indoor nighttime levels during Project O&M ranged from 4 to 30 dBA and are thus in compliance with the 45 dBA sleep disturbance target.

The Wind Farm was assessed for the potential to emit low frequency noise (LFN). To determine if a noise source is likely to generate high LFN, the difference between the C weighted sound levels and the A weighted sound levels of the source are calculated and compared to a limit of 10 dB. If 10 dB is exceeded, then the source is generally considered to be an LFN source. Additionally, Health Canada suggests that if the energetic sum of the sound pressure levels within the 16 Hz, 31.5 Hz, and 63 Hz bands (unweighted, dBZ) exceed 70 dB, then mitigation measures should be explored to reduce these levels to within compliance. While the difference between A- and C-weighted noise levels calculated for the Wind Farm during the O&M Phase exceed 10 dB for the majority of PORs, the total LFN at each POR remains below 70 dB. As such, LFN is not anticipated to be an issue at surrounding receptors during Project O&M.

Vibration

The Project will generate vibrations during all Project Phases. Risk of vibration effects would be primarily occurring during the Construction Phase resulting from the operation of high vibration generating pieces of equipment. Vibration emissions during the construction period will frequently occur but will be transient due to the nature of activities and construction schedule. Furthermore, the minimum separation distance between the closest receptor to vibration intensive activities during construction activities is 84 m, which is outside the highest vibration zone of influence. It is anticipated that the O&M Phase will generate lower vibration levels at sensitive receptors compared to the Construction Phase. Since sources of vibration at the Wind Farm will be set back from dwellings by more than 1,000 m, Project interactions with baseline vibration levels are not anticipated. Similar to the O&M Phase, Project Decommissioning and Rehabilitation activities as well as Accidents and Malfunctions will result in lower risk of vibration effects than during construction. Due to established Project setbacks from dwellings and the transient nature of decommissioning activities and Accidents and Malfunctions, interactions with baseline vibration levels are unlikely. Following decommissioning, vibration levels are anticipated to return to pre-Project conditions.

4.2.2 Aquatic Environment

The aquatic environment is a key VC due to its ecological, cultural, and regulatory importance. It may also interact with the Project during all Phases and Unplanned Events. There are eight KIs through which the Aquatic Environment VC and the Project interact: Groundwater Resources, Surface Water Resources, Freshwater Fish and Fish Habitat, Marine Fish and Fish Habitat, Fisheries and Aquaculture, Species at Risk, Habitats of Conservation Concern, and Marine Biosecurity. Some aspects of the Aquatic Environment, such as surface water, provide a resource that can be utilized by the Project (along with existing usage). The Aquatic Environment also provides a pathway that links Project activities/elements to other environmental receptors. Aquatic resources such as fish and fish habitat interact with the Project and function as receptors. The PA is proximate to Placentia Bay, which is utilized by several species at risk and contains many biologically important habitats of conservation interest. Marine shipping associated with the Project may interact with the marine environment and has the potential to introduce aquatic invasive species (AIS).

4.2.2.1 Scope, Measurable Parameters, and Definition of Significant Effects

The Project will interact directly with freshwater and marine systems near Sunnyside and Come By Chance. These environments support sensitive species, including commercially and culturally important fish like Atlantic salmon and capelin. Any disturbance, such as sedimentation, flow alteration, or spills, could affect habitat quality and downstream users. Given the potential for harm during construction and operation, including erosion, water withdrawals, or spill risks at the jetty, robust environmental planning will be required. Avoidance, minimization, and mitigation measures such as erosion control, spill response systems, and environmental monitoring will be key to managing risks. Protecting aquatic resources is key to maintaining biodiversity and complying with legislation. Table 4.2.2-1 details applicable measurable parameters of each of the eight Aquatic Environment KIs, as well as the geographic scope covered in this assessment.

Studies determined that no critical habitats for freshwater or marine aquatic species, as defined by the SARA or NL ESA, and no Marine Protected Areas (MPAs), were identified in the RAA. However, several potential salmonid spawning habitats, six scheduled salmon rivers, and one Ecologically and Biologically Significant Area (EBSA) were identified in the RAA and encompassed the extent of the Habitats of Conservation Concern KI assessed.

Table 4.2.2-1 Scope and Measurable Parameters of Key Indicators: Aquatic Environment.

Key Indicator	Scope	Measurable Parameter(s)
Groundwater Resources	PA	Water quality (i.e., concentration of chemical parameters compared to applicable guidelines). Water quantity (i.e., alteration of baseflow (%),

Key Indicator	Scope	Measurable Parameter(s)
		change in well yield (L/min) for existing well users, change of groundwater level relative to existing conditions (m).
Surface Water Resources	LAA	Water quantity (i.e., changes in mean annual flow (m ³ /s), runoff (mm), and water levels (m)); water quality (i.e., changes in concentration of chemical parameters compared to applicable guidelines).
Freshwater Fish and Fish Habitat	LAA	Change in habitat quantity (i.e., area in m ² or hectares); change in physical habitat quality (e.g., wetted width (m), depth (cm), water velocity (m/s), substrate classification, cover (%)); change in habitat water quality (e.g., water temperature (°C), pH; dissolved oxygen (DO -% saturation); salinity (ppt), conductivity (µS/cm), turbidity (FNU); nutrients, total metals, ammonia, total suspended solids (TSS), and alkalinity (mg/L); colour (TCU)); change in fish survival (e.g., abundance (numbers of fish), change in community structure (proportion of each species %), meristic characteristics of fish population); change in abundance and richness of benthic invertebrates.
Marine Fish and Fish Habitat	RAA	Change in marine physical habitat quality (i.e., temperature change reduction distance (m), salinity (ppt) in effluent receiving waters); change in marine water quality (i.e., pH, turbidity (FNU), TSS (mg/L), ammonia (mg/L), chlorophyll a (µg/L));
Fisheries and Aquaculture	RAA	Change in landed weight (kg) of commercially and recreationally important species such as snow crab, American lobster, sea scallops, Atlantic cod, and Atlantic herring; change in marine traffic volumes (vessels per day per km ²).
Species at Risk	RAA	Change of species designation under SARA, NL ESA, or IUCN Red List; change in presence/absence of American eel, Atlantic salmon, Atlantic Cod, American Plaice, Leatherback turtles (qualitative)
Habitats of Conservation Concern	RAA	Extent of loss or disturbance of habitats of conservation concern including salmonid spawning habitats, Scheduled Salmon Rivers, and the Placentia Bay Ecologically and Biologically Significant Area (EBSA) (i.e., area in km ² or hectares).
Marine Biosecurity	RAA	Change in number of DFO data reports of AIS in RAA (number of individual records).

For the Aquatic Environment VC, a significant adverse residual effect was defined as one having a high magnitude, or a medium magnitude in combination with either a high frequency or a low level of confidence in the prediction. The definition of potential significant adverse residual effects was adjusted for select KIs as follows:

- Groundwater Resources – long-term or irreversible Project-related effect on public or industrial wellhead area through altered groundwater recharge zones, groundwater levels, groundwater yield quantities, and groundwater qualities beyond natural variability.
- Surface Water Resources - long-term or irreversible Project-related effect on watercourses or waterbodies through alerting surface water drainage pathways, standing water levels, mean annual flow, and surface water qualities beyond the range of natural variability. Impairment of public or industrial water supplies.

- Freshwater Fish and Fish Habitat – Project-related Harmful Alteration, Disruption or Destruction (HADD) of freshwater fish habitat or the death of freshwater fish, as defined by the **Fisheries Act**, that cannot be avoided, minimized, reversed through restoration or rehabilitation, or offset;
- Marine Environment regarding marine fish and fish habitat – Project-related HADD of marine fish habitat or the death of marine fish, as defined by the **Fisheries Act**, that cannot be avoided, minimized, reversed through restoration or rehabilitation, or offset;
- Fisheries and Aquaculture – A verified loss of net income from commercial fishing or aquaculture operations due to environmental effects caused by the Project, persisting for at least one fishing season; or the displacement of fishers as a result of long-term changes in marine traffic density.

4.2.2.2 Baseline Conditions

Baseline conditions for the Aquatic Environment have been characterized through desktop studies of scientific papers and reports, publicly available long-term datasets, and baseline field monitoring programs. Placentia Bay is a very well-studied region of Newfoundland, and there is a wealth of information on the aquatic environment to inform the effects assessment of the Marine Environment, and sufficient knowledge of the KIs on which to base effects predictions. A summary of findings is provided in Section 3.1.2 and 3.2.2, with supporting documentation in the following appendices:

- Appendix B1 – Aquatic Environment Baseline Study, which includes site-specific field surveys for freshwater and marine environments;
- Appendix B2 – Effluent Dispersion Modelling, which models the expected dispersion of Project effluent into the marine environment;
- Appendix B3 – Effluent Dispersion Modelling for the new outfall, which models the expected dispersion of Project effluent into the marine environment; and
- Appendix C – Surface Water Study, which combined desktop analyses of regional hydrology and field surveys of the local source water system.

Groundwater Resources

A desktop review of surficial and bedrock geology maps was conducted. Thin surficial rock and lithified bedrock were identified in the LAA. These conditions support a shallow and limited groundwater system. No registered public groundwater supply wells are present within the LAA. Groundwater quantities were assessed based on publicly available community well yield data, which indicated very low groundwater yield compared to surface water quantities (Section 3.1.2.2). As a result, groundwater contributions to the overall water resource system appear to be limited.

Surface Water Resources

Surface water resources within the LAA include Inkster's Pond Industrial Water Supply area, as well as watersheds near the proposed wind turbine placement area and transmission line. These surface water features include watershed areas, waterbodies, and watercourses, which may be influenced by site preparation, construction activities, and O&M of the HGP and HP.

A baseline field monitoring program was conducted to characterize water quality, levels, flows, and seasonal dynamics within the Inkster's Pond Industrial Water Supply Area which currently supplies water to the facilities in the Project Area, including Inkster's Pond and several others which actively supply water via outlet control structures (i.e., Barrisway Pond and Willie Jarge Pond).

Field data obtained from May 2024 to May 2025 were supplemented by long-term regional climate and hydrometric records from the WSC. The comparison confirmed that the full hydrologic range was captured, including a 120-day low flow period and high flows associated with peak precipitation and snow melting events. The overall average unit flows during the baseline period ranged from 35.0 to 36.1 L/s/km², comparable to the long-term regional average of 37.2 L/s/km².

Freshwater Fish and Fish Habitat

Freshwater fish and fish habitat within the PA were characterized through baseline studies in 2024. Freshwater fish habitat and water quality was assessed at candidate road crossings and transmission line crossings for streams and waterbodies potentially affected by the Project. The fish communities at these locations were assessed and were dominated by brook trout, while Atlantic salmon, brown trout, threespine stickleback, and American eel were also occasionally present. Data were collected on streamflow conditions (depth and velocity, discharge) and benthic invertebrate communities for stream crossings, while plankton communities were assessed at waterbody crossing sites. Historical water quality data collected by NL DECC WRMD was accessed to supplement field data collection.

The Project Area freshwater habitats, primarily small streams, are characterized by common mesohabitat types such as pools, runs, and riffles, with dominant substrates including boulder and silt/clay, and smaller amounts of gravel crucial for spawning.

Marine Fish and Fish Habitat

Marine fish and fish habitat within the LAA were characterized through EEM studies conducted by Braya in 2023 and baseline studies conducted in 2024. Data on water and sediment quality, the benthic invertebrate community, and polycyclic aromatic hydrocarbon (PAH) concentrations in blue mussel tissue were available from the 2023 EEM studies. Conductivity/temperature and depth (CTD) profiling was

completed at three marine stations in July, September and December 2024. Continuous recording of water temperatures at selected depths and subsequent profiling of the temperature regime from mid-July to early December 2024 was completed. Mean salinity was consistent across months with slight variation due to surface runoff. Mildly alkaline pH levels were consistent (8.02 to 8.11), and turbidity was low (0.33 to 0.62 FNU). Temperature profiling showed seasonal thermocline development in July and December typical of coastal environments, with water ranging from stratified (11.25°C to 16.35°C in mid-July) to relatively uniform (17.02°C to 17.71°C in late September).

Marine sediment primarily featured well-sorted coarse sand and cobble, contributing to low benthic invertebrate numbers, as well as low benthic species diversity. The 2023 EEM study reported an average abundance of 38 organisms and 2.8 taxa, predominantly polychaete worms, echinoderms, amphipods, oligochaetes, and nematodes. Drop camera surveys were conducted to assess marine habitats, including substrate, vegetation, and marine epifauna on the seafloor within the LAA. Drop camera surveys identified larger benthic macrofauna such as Cunner, Winter flounder, Sea Star, Hermit Crab, Crab, Sea Anemone, and Sea Urchin.

A modelling study was completed to assess the dispersion of effluent from the Project if North Atlantic were to use the Braya outfall infrastructure. Temperature changes generally met the <1°C guideline at short distances, with the most challenging scenario (high-temperature effluent in summer without current) requiring 33.73 m for compliance. Salinity changes consistently remained within the 10% guideline, as effluent salinity was close to ambient levels. Due to the distance for temperature to be within compliance using Braya's outfall infrastructure, a second modelling study was completed to assess dispersion of effluent from the Project using a new outfall location, North of the jetty. Temperature changes generally met the <1°C guideline at short distances, with the most challenging scenario (high-temperature effluent in winter without current) requiring 5.22 m for compliance. Salinity changes consistently remained within the 10% guideline, as effluent salinity was close to ambient levels.

Fisheries and Aquaculture

Available information on commercial, recreational, and Indigenous fisheries that occur near or within the RAA was reviewed. There are negligible commercial freshwater fisheries within the RAA due to a moratorium on Atlantic salmon and declining American eel licenses. According to recent angling catch data from DFO, recreational fisheries are pursued in the RAA, targeting freshwater species like brook trout (the most common freshwater recreational catch), Atlantic salmon (in six scheduled rivers), rainbow smelt, and brown trout. Marine recreational groundfish fishing for Atlantic cod occurs annually from July until September.

An overview of commercial fishing activities within Placentia and Trinity Bay was conducted to assess potential interactions between the fishing industry and the Project. Commercial fisheries data (landed

weight and corresponding monetary value) for NAFO sub-division 3Psc were reviewed for species fished in Placentia Bay from 2018 to 2024, along with the concentration of fixed and mobile fishing gear, and interview data as collected by DFO and contained in a Community-Based Coastal Resource Inventory. For commercial marine fisheries in Placentia and Trinity Bay (NAFO 3Psc), snow crab, Atlantic cod, and American lobster were the top species by landed value from 2018 to 2024, with fixed gear being more commonly used than mobile gear. Indigenous fisheries, primarily undertaken by Miawpukek First Nation, involve both Food, Social, and Ceremonial (FSC) and commercial licenses for various species (e.g., snow crab, Atlantic salmon, American eel), but there is no evidence of substantial FSC activity within the RAA, likely due to distance.

Species at Risk

Two freshwater aquatic species, American eel and Atlantic salmon (South NL population), have been designated by COSEWIC, or under SARA and/or NL ESA, and are present in the RAA as both were captured in baseline studies in 2024. A total of 43 marine species (fish, mammals, and reptiles) of Special Conservation Concern (SCC) in Placentia Bay and the Avalon Peninsula were identified; however, only two marine finfish (Atlantic cod, American plaice) were expected to be found commonly in the RAA and LAA. The life histories and habitat requirements of these four species were assessed in the context of potential interactions with the Project.

Habitats of Conservation Concern

No critical habitats (as defined by SARA or NL ESA) for freshwater SAR or SCC were identified in the RAA. No discrete spawning habitats were documented during baseline studies. Placentia Bay is a designated Ecologically and Biologically Significant Area (EBSA) within the Placentia Bay-Grand Banks Large Ocean Management Area (PBGB LOMA), and this designation encompasses both the RAA and the LAA. No Marine Protected Areas (MPAs) or critical habitats, as defined under SARA and the **Newfoundland and Labrador Endangered Species Act** (NL ESA), were within the RAA or LAA. Sensitive marine habitats that occur within the RAA, but not within the LAA, include capelin spawning sites, eelgrass meadows, salt marshes, wetlands, and scallop beds.

Marine Biosecurity

The most severe biosecurity risk to Newfoundland ports is aquatic invasive species (AIS). During the Project Construction and O&M phases, vessel traffic will be the main concern for AIS introduction and spread. Available information on AIS in Placentia Bay from 2006 to 2024, as provided by DFO, was reviewed, including nine reports of AIS in the RAA. Of these nine, six species were detected in Arnold's Cove and/or Come By Chance Harbours, including: Coffin Box (*Membranipora membranacea*); European Green Crab (*Carcinus maenas*); Golden Star Tunicate (*Botryllus schlosseri*); Orange Ripple

Bryozoan (*Schizoporella japonica*); Oyster Thief (*Codium fragile ssp. fragile*); and Vase Tunicate (*Ciona intestinalis*). One species, the Ribbed Bryozoan (*Juxtacribrilina mutabilis*), was detected near the port of Bull Arm. Areas in NL that have higher levels of shipping and boating traffic than others, such as near the shipping lanes of Placentia Bay, are actively monitored for AIS by DFO.

4.2.2.3 Project-Environment Interactions

Potential interactions with the identified KIs of the Aquatic Environment VC are summarized in Table 4.2.2-2. In Section 5.2, a review of the significance criteria and determination of residual effects will be described.

Table 4.2.2-2 Potential Project Interactions with Aquatic Environment.

Project Component and Activity Description	Key Indicators: Aquatic Environment							
	Groundwater Resources	Surface Water Resources	Freshwater Fish and Fish Habitat	Marine Fish and Fish Habitat	Fisheries and Aquaculture	Species at Risk	Habitats of Conservation	Marine Biosecurity
Construction Phase								
Site Preparation	X	X	X	X				
Roads	X	X	X			X		
Staging and Laydown		X	X			X		
Temporary Batch Plant		X						
Equipment and Materials Transport		X		X	X	X	X	X
Wind Turbine Foundations		X	X			X		
Electrical Infrastructure		X	X			X		
Wind Turbine Installation		X	X			X		
Hydrogen Generation Plant	X	X		X	X			
Hydrogenation Plant	X	X		X	X			
Toluene and MCH Storage and Transfer		X	X	X	X	X	X	X
Flare Stacks				X				
Administration Buildings	X	X	X					
Temporary Workforce Accommodations		X	X					
Employment and Expenditures								
Operation and Maintenance								
Wind Turbine Operation								
Wind Turbine Maintenance		X	X					
Electrical Infrastructure								
Venting and Flaring				X				
Road Maintenance		X	X			X		
Hydrogen Generation Plant		X		X				
Hydrogenation Plant		X		X				

Project Component and Activity Description	Key Indicators: Aquatic Environment							
	Groundwater Resources	Surface Water Resources	Freshwater Fish and Fish Habitat	Marine Fish and Fish Habitat	Fisheries and Aquaculture	Species at Risk	Habitats of Conservation	Marine Biosecurity
Toluene and MCH Storage and Transfer				X	X	X	X	X
Administration Buildings								
Employment and Expenditures								
Decommissioning and Rehabilitation								
Electrical Infrastructure		X	X			X		
Wind Turbines		X	X			X		
Hydrogen Generation Plant	X	X		X				
Hydrogenation Plant	X	X		X				
Toluene and MCH Storage and Transfer		X						
Terrain Reclamation	X	X	X			X		
Temporary Workforce Accommodations		X						
Administration Buildings	X	X						
Employment and Expenditures								
Accidents and Malfunctions								
Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials	X	X	X	X	X	X	X	
Flaring /Venting of Hydrogen and Other Gases				X				
Traffic Incidents		X	X	X				
Fires and Explosions			X	X				
Dislodging of a Wind Tower or Wind Turbine Blade			X					
Ice Throw				X				
Occupational Hazards and Human Injuries								
Failure of Industrial Water Supply		X						
Wildlife Emergencies/Incidents								
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the KI are not expected.								

Groundwater Resources

Project-related interactions with groundwater are expected to be limited during all phases. During construction, localized ground disturbance from site preparation, excavation, and foundation installation may temporarily expose shallow subsurface materials, but substantial interaction with groundwater is not anticipated. This is due in part to the presence of shallow surficial rock and well-lithified, impermeable bedrock at the wind turbine placement sites, as confirmed by geotechnical studies (AllRock, 2025). During O&M, groundwater use is not required, and interactions will remain minimal. Similarly, groundwater interactions during decommissioning and rehabilitation are expected to resemble those

during construction. The presence of extensive bogs and ponds in the region, along with baseline hydrology data, suggests poor groundwater drainage and minimal groundwater recharge, with water remaining at or near the surface. In the area near the North Atlantic Logistics Terminal, infrastructure is located close to existing industrial zones and the coast, where poor drainage and fault-controlled groundwater flow direct any potential runoff toward the sea or existing disturbed areas. Consequently, even in the event of accidental releases of hazardous materials, the risk of widespread groundwater contamination is low. Overall, groundwater resources are unlikely to be substantially affected by the Project.

Surface Water Resources

Surface water is likely to interact with the Project during all phases. Potential interactions include land disturbance near watercourses (potentially causing erosion and/or siltation/sedimentation), potential alteration of surface drainage patterns, surface water withdrawal during the Construction Phase, surface water withdrawal for hydrogen production at the HGP and HP, and a risk of accidental releases of contaminant.

During Construction, surface water interactions will result from land clearing, grading, excavation, road building, and water withdrawal activities. These actions may increase the extent of exposed soils and alter existing surface runoff pathways. Increased runoff and sediment mobilization may elevate TSS content in adjacent watercourses. Additionally, water from Lady Cove Pond will be extracted during construction, resulting in temporary downstream reductions in flow. However, the impact on water quantity is expected to be negligible, as the maximum projected monthly withdrawal represents 0.5% of the estimated average monthly water yield for Lady Cove Pond.

During O&M, the Project will withdraw water from Inkster's Pond to support production and emergency fire protection. These withdrawals will occur throughout the lifespan of the HGP and HP and may change surface water quantity downstream of the industrial water source. The changes, however, are expected to be small, as the proposed maximum water withdrawal rate (0.030 m³/s) is just 11% of the average outflow at the Barrisway Pond diversion point.

Decommissioning activities are expected to temporarily interact with surface water resources similarly to during O&M. The removal of infrastructure may disturb stabilized soils and increase TSS concentrations.

Unplanned events during any Project Phase may result in surface water contamination. These include spills/releases or fires/explosions. An Emergency Response Plan (ERP) (Appendix M) was developed to minimize the likelihood and severity of these unplanned events.

Freshwater Fish and Fish Habitat

During the Construction Phase, freshwater fish and fish habitat can be affected by alterations to stream flow and habitat features, or by the creation of barriers to fish movement, removal of riparian vegetation, introduction of sediments and contaminants, and potentially direct injuries or mortalities from in-water work. Many of the interactions will be possible during the preparation of laydown areas, excavation for foundations, road construction, including water crossings, installation of collector systems, and transmission lines and substations. These activities can alter fish habitat quality from runoff and changes to water flow patterns, either by creating physical or velocity barriers to fish movement or restrictions to inflows/outflows along water courses, which may affect fish health and survival. Minor quantities of fish habitat may be lost because of the construction of water crossings for the road network associated with the Wind Farm. These locations also have the potential to result in an obstruction to fish passage if not properly designed and installed. Proper installation of culverts will be essential to maintain connectivity between downstream and upstream habitats to permit movement and migration of fish as required for their life history processes.

During O&M of the Wind Farm and transmission lines, runoff from access roads may affect fish habitat quality, fish production, health, and survival. Since the water supply for Project operation will be from an existing industrial water supply area, no new aquatic habitat interactions will be introduced.

The effects of Decommissioning and Rehabilitation activities on fish and fish habitat are anticipated to be similar to Construction; however, it is expected there will be no in-water work associated with this Project Phase as it assumed the existing road network and fish passage structures will remain in place.

Marine Fish and Fish Habitat

Marine fish and fish habitat may be affected by nearshore construction and operations activities. Project site preparation and civil works during construction will occur on land and a new, dedicated water outfall will be constructed North of the jetty. Operation of the HGP and associated infrastructure, and surface runoff from facilities, will result in the release of treated effluent into the marine environment near the plant site. Wastewater (e.g., surface water runoff, demineralization wastewater, sanitary discharge) will be directed to treatment systems that will operate in compliance with applicable regulatory approvals and discharge criteria. The new outfall will be constructed for the discharge of demineralization water from the HGP, while the existing outfall for Braya Refinery will be used to discharge the remaining effluents related to the Project.

Construction activities such as mobile equipment operation, use of stationary construction equipment, blasting, general site preparation, and general operational activities near the port site will generate noise in the LAA. Anthropogenic noise can interfere with whale communication, increase susceptibility to

acoustic masking, and alter feeding and movement behaviours (Cunningham and Mountain, 2014; Erbe et al., 2019; Holt et al., 2021). Increased noise and vibration may also affect fish by elevating stress, impairing predator detection, and causing temporary hearing loss (Brown et al., 2021; Ivanova et al., 2018, 2019; Popper et al., 2014). Pinniped haul-out behaviour is also highly sensitive to elevated noise levels (London et al., 2012). Overall, increased ocean noise levels can affect marine animal behaviours, possibly decreasing abundances in nearby areas. However, as described in Section 2.3.5.6 of the Registration, approximately one MR vessel per month is anticipated during the O&M phase for LOHC transport; the impacts would be low considering the existing marine traffic in Placentia Bay and the mitigations outlined in Section 4.5.2 of the Registration.

Although the Project will introduce only a limited number of vessel transits relative to existing activity in Placentia Bay, vessel strikes are a well-known cause of injury and mortality for marine mammals, sea turtles, and large fish species. Collisions occur when vessel traffic overlaps with the presence of marine wildlife and are more likely in areas that are used by wide-ranging species such as cetaceans, which are known to occur throughout Placentia Bay. Many marine animals surface only briefly and with minimal visual profile, making them difficult for vessel operators to detect. Some species may not be able to sense or avoid approaching vessels, especially when vessel speeds are elevated (NOAA, 2026).

Species-specific behaviours can further increase collision risk. North Atlantic Right Whales, while not commonly documented in Placentia Bay relative to other regions of Atlantic Canada, can be present in the RAA. Their lack of a dorsal fin makes them especially difficult for mariners to see, and mothers with calves often rest or nurse at the surface. Individuals feeding at or just below the surface are similarly vulnerable because these behaviours increase the amount of time they remain within the strike zone (Soldevilla et al., 2017a).

The severity of a vessel strike is strongly influenced by vessel speed. Lethal outcomes become increasingly likely at speeds between 10 and 15 knots, and collisions above 15 knots are frequently fatal for large whales (Vanderlaan and Taggart, 2006). As modern commercial vessels often travel at or above these speeds, any transiting vessels operating at higher velocities have the potential to cause serious or fatal injury if a collision occurs. Transport Canada has established extensive mandatory and voluntary protection measures in Atlantic Canada to reduce risks to the North Atlantic Right Whale and other species. These measures include speed-restricted zones, dynamic and seasonal management areas, restricted access zones, and voluntary slowdowns in key migration corridors. These tools are designed to reduce both the probability and severity of vessel strikes by limiting vessel speeds when whales are present or expected to occur (TC, 2025).

Placentia Bay supports the seasonal presence of several whale species, including humpback whales, minke whales, and fin whales, and occasionally rare or endangered species pass through during migration. Any vessel transiting to or from the Project site introduces some potential for interaction with

marine mammals. However, the relatively limited number of vessel movements associated with the Project, combined with established federal mitigation practices, substantially reduces the likelihood of vessel strikes.

The minimal connection between the Project and the marine environment, combined with adherence to applicable regulatory standards, will result in few potential environmental effects during Construction, O&M and Decommissioning and Rehabilitation Phases. Unplanned events could result in deposition of contaminants or deleterious substances into the marine environment, resulting in short-term effects on fish and fish habitat.

Fisheries and Aquaculture

Potential effects of the Project on fishing grounds/aquaculture sites during construction are related to an increase in vessel traffic. These activities can limit access to fishing grounds and potentially introduce or spread AIS via transiting vessels. An increase in vessel activity has the potential to increase the risk of collisions or damage to fishing gear. The introduction of AIS through Project vessel activity could also disrupt local aquaculture operations (see Marine Biosecurity). Several AIS species (e.g., golden star tunicate, oyster thief, vase tunicate, and violet tunicate) are known to cause issues with marine-based shellfish aquaculture operations. AIS can cause damage to important fish habitats that directly or indirectly support commercial fish species. There is, however, very limited commercial and recreational fishing occurring near the LAA and existing aquaculture operations are well removed from the LAA.

During O&M, marine infrastructure and vessel activity may result in temporary loss of access to fishing grounds. Changes in water quality during operation can also lead to changes in fishing grounds/aquaculture sites and productivity. Increases in noise and vibration from increased vessel traffic may cause auditory masking. As above, limited fishing activity occurs near the LAA and no aquaculture operations in Placentia Bay are close to or planned for the RAA, and the minimal increase to vessel traffic will limit interactions and potential effects during O&M.

Potential effects of the Project on fishing grounds/aquaculture sites during Decommissioning and Rehabilitation are like the Construction Phase and are related to an increase in vessel traffic. It is anticipated that after the Project lifespan, the marine infrastructure will remain in place for future use by other industries.

Species at Risk

Catadromous American eel and anadromous Atlantic salmon (South NL population) have been designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or under SARA and/or NL ESA, and both were captured in the PA in 2024. It is unclear if the salmon (juveniles)

were from anadromous stock or were landlocked (i.e. ouananiche). Anadromous Atlantic salmon also occur in scheduled salmon rivers in the RAA, but not in the LAA or PA, and so scheduled rivers will not interact with or be affected by Project activities.

Most of the potential interactions with American eel and Atlantic salmon will occur during Project Construction owing to activities such as preparation of laydown areas, excavation for foundations, road construction, water crossings, installation of collector systems, transmission lines and substations. These activities can alter eel and salmon habitat quality because of runoff and water flow patterns that create physical or velocity barriers to movement. These interactions could in turn affect fish health and survival. Eel and salmon habitat could also be lost because of the installation of culverts. During O&M of the Wind Farm and transmission lines, eel and salmon habitat may be affected by runoff from access roads, which may in turn affect habitat quality, production, health and survival. Water supply for operation of the HGP and HP will be from the industrial water supply and will not affect eels/salmon and their habitats. The effects of Decommissioning and Rehabilitation activities on eel and salmon habitat are anticipated to be similar to Construction, however, it is expected there will be no in-water work associated with this Project Phase. With proper design and adherence to standard construction and maintenance measures, the potential level of interaction with eels/salmon and their habitats is predicted to be minimal.

Atlantic cod (Laurentian North population) and American plaice (NL population) have a high probability of occurrence in the marine areas of the RAA and LAA. Other SARA-listed species with the potential to occur in Placentia Bay include white shark, northern wolffish, spotted wolffish, Atlantic wolffish and banded killifish. Leatherback turtles and blue whales, two SARA listed species, are occasionally sighted in Placentia Bay. The potential for any of these species to occur in the RAA or LAA is extremely low. The Project will have limited aspects carried out in the marine environment other than transportation activities, and therefore, the potential level of interaction with marine species at risk is predicted to be minimal.

Habitats of Conservation Concern

No critical habitats (as defined by SARA or NL ESA) for freshwater species at risk or of conservation concern were identified in the RAA. Spawning habitats are important for reproduction and recruitment for salmonid populations; however, no discrete spawning habitats were documented during baseline studies in 2024.

The whole of Placentia Bay is designated as an Ecologically and Biologically Significant Area (EBSA), and this would include the RAA and LAA. Sensitive areas near the RAA and LAA include capelin spawning beaches, eelgrass beds, salt marshes, wetlands, and scallop beds. There are no Marine Protected Areas (MPAs) or critical habitats, as defined under SARA and the NL ESA, identified near the RAA or LAA. Marine habitats of conservation concern will not interact with or be affected by the Project.

Marine Biosecurity

Invasive species are a concern, both with respect to new introductions, and the possible spread of AIS species already present within Placentia Bay. There are extensive requirements in place in Canada (**Fisheries Act** - Aquatic Invasive Species Regulations), as well as international protocols, to prevent introductions of invasive species through mechanisms such as ballast water exchange or hull fouling.

To reduce or eliminate the risk of AIS and pathogens being introduced into Canadian waters because of shipping, all ships are required to exchange ballast water in accordance with the *Ballast Water Control and Management Regulations* (Transport Canada 2006) and to follow international protocols (International Maritime Organization Code for Approval of Ballast Water Management System). The regulations require that ships transiting to Canadian ports exchange ballast water at sea in deep water away from coastal zones. The exchanged ballast water is then to be treated by a Ballast Water Treatment System (BWST) onboard the vessel during the remainder of the voyage. No interaction of ballast waters with the PA (e.g., introduction of invasive species) is anticipated.

Fouling is the unwanted growth of biological material such as barnacles and algae on the surface of a hull submersed in water. Hull fouling can increase the risk of invasive aquatic species and pathogens being introduced into Canadian waters. Vessels transiting to Come By Chance from international ports will be required to meet the IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. This convention requires that vessels possess International Anti-fouling System Certification and that an anti-fouling system be in place on all vessels.

During Construction, the major supply route for equipment will be via marine traffic and originating at ports beyond Newfoundland and Labrador. Laden vessels will have a minimum of ballast water onboard. During O&M, hydrogen product will be shipped to European ports via charter vessels. When transiting to Come By Chance, it may be assumed that these vessels will carry ballast water and require exchange as per the IMO protocol. During the Decommissioning and Rehabilitation Phase it may be assumed that some equipment and Project structures will be shipped for sale or disposal using chartered vessels. It may be assumed that these vessels will be carrying ballast water during inbound voyages. It is unlikely that an unplanned event would act as a possible mechanism for invasive species introduction. During all shipping activities related to the Project, it is unlikely that vessels will transit to other Placentia Bay or Newfoundland ports.

4.2.3 Terrestrial Environment

The Terrestrial Environment is a key Valued Component (VC) due to its ecological, cultural, and regulatory significance. It may interact with the Project during all phases and in the event of unplanned incidents. There are seven Key Indicators (KIs) through which the Terrestrial Environment VC and the

Project may interact: Flora (including Rare Plants), Wetlands, Fauna (Mammals), Avifauna, Rare Lichens, Bats, and SAR Insects.

The KIs above may all interact with the Project and existing land use activities in the region. The Project Area (PA) encompasses a wide variety of habitats used by a diverse suite of terrestrial flora and fauna, including Species at Risk, like the Red Crossbill and little brown myotis. The PA also contains wetlands and barrens that often have heightened potential for SAR and SCC flora.

4.2.3.1 Scope, Measurable Parameters, and Definition of Significant Effects

The Project will interact directly with terrestrial environments in the PA, surrounding Sunnyside and Come By Chance, and indirectly with those in the LAA and RAA. The forests, wetlands, barrens, and other land-based ecosystems support a variety of flora and fauna species and communities. Disturbances such as vegetation clearing, machine noise, human presence, soil disturbance/compaction, erosion, or accidental spills can degrade habitat quality, fragment habitats, reduce biodiversity, and diminish ecosystem services. Potential interactions with the identified KIs of the Terrestrial Environment VC are summarized in Table 4.2.3-1.

Table 4.2.3-1 Scope and Measurable Parameters of Key Indicators: Terrestrial Environment.

Key Indicator	Scope	Measurable Parameters
Flora	PA	Area of suitable habitat for common vegetation communities disturbed by the Project; amount of suitable SAR or SCC habitat disturbed (km ²).
Wetlands	PA	Area of wetlands disturbed (km ²).
Fauna (Mammals)	LAA	Area of habitat suitable for regionally common or abundant mammalian species lost or disturbed (km ²); area of habitat suitable for mammalian SAR and SCC disturbed (km ²); number of (direct and indirect) individual mortalities.
Avifauna	LAA	Area of habitat suitable for common resident avifauna species disturbed (km ²); area of habitat suitable for staging migratory avifauna species disturbed (km ²); area of habitat for avian SAR disturbed (km ²); number of individual mortalities from collisions with wind turbines.
Rare Lichens	PA	Area of habitat suitable for lichen SAR lost or disturbed (km ²).
Bats	LAA	Area of habitat suitable for resident bat SAR disturbed (km ²); area of habitat suitable for migratory bat SAR disturbed (km ²); number of individual mortalities from collisions with wind turbines.
SAR Insects	LAA	Area of habitat suitable for insect SAR disturbed (km ²).

The assessment criteria used to determine the Project's effects on the Terrestrial Environment VC are provided in Table 4.1-3 of Section 4.1.7 above. For the Terrestrial Environment VC, a significant adverse residual effect was defined as one having a high magnitude, or a medium magnitude in combination with

either a high frequency or a low level of confidence in the prediction. A significant adverse residual effect on SAR or Species of Conservation Concern (SCC) and their habitat was defined as one that threatens the long-term persistence, viability, or recovery of a species population in the PA, LAA, or RAA.

4.2.3.2 Baseline Conditions

Baseline conditions for the Terrestrial Environment have been characterized through desktop reviews of scientific literature, regional ecological reports, publicly available datasets like the AC CDC records, and field-based baseline studies. Ample data and information were available to inform the effects assessment of the Terrestrial Environment, including a strong knowledge base for the selected Key Indicators (KIs) to support predictive analysis of Project interactions.

A summary of baseline findings is provided in this section, with detailed supporting documentation located in the following appendices:

- Appendix D1 – Avifauna Baseline Study.
- Appendix D2 – Bats Baseline Study.
- Appendix D3 – Ecological Land Classification Baseline Study.
- Appendix D4 – Mammals Baseline Study.
- Appendix D5 – Rare Lichens Baseline Study.
- Appendix D6 – Rare Plants Baseline Study.
- Appendix D7 – Rare Insects Baseline Study.

Flora

Rare plants were chosen as a KI because they are important to biodiversity, cultural heritage, and ecological stability. Their conservation is supported by both regulatory frameworks and local ecological knowledge, making their protection a priority in Project planning. Newfoundland hosts a variety of globally and regionally rare plant species, including boreal, subarctic, and coastal endemics. Rare plants often occur in sensitive ecosystems such as limestone barrens, peatlands, and coastal headlands, which are vulnerable to disturbance.

A desktop review of rare flora was conducted, including a data query with the Atlantic Canada Conservation Data Centre (AC CDC) to determine if any rare plants were known from the 5 km buffer around the PA. The AC CDC ranks plant species based on rarity (e.g., S1–S3), and these ranks are frequently used to flag conservation concerns during the EA process. Several S-ranked species were identified from the area in the data query and were considered during the planning of field surveys in the

PA. Dedicated rare plant surveys were conducted in the PA in 2024. Several S-ranked species of S3 to S1 rankings were observed, including two S1 species. Appendix D6 describes the findings of that study in more detail.

Wetlands

Wetlands were delineated using ArcGIS through the development of the Ecological Land Classification. Several wetland types exist throughout the PA, LAA, and RAA, as discovered during field surveys for the ELC and other terrestrial components. A desktop review was also conducted to determine if there was existing information on wetlands in the region, and useful information was gleaned from the Forest Resource Inventory (FRI), maintained by the NL Department of Fisheries, Forestry and Agriculture (FFA). This GIS tool provided a foundation for the ELC, including the locations of most wetlands in the Project Area. However, a secondary desktop survey of the Project Area was necessary to more accurately delineate boundaries and identify wetlands that were not represented in the FRI.

Wetlands were assessed according to the Canadian Wetland Classification System (CWCS) (NWWG, 1997). Wetlands in NL are grouped by CWCS into the following: (i) bog; (ii) fen; (iii) swamp; (iv) marsh; and (v) shallow water wetlands (NWWG, 1997). This information was collected during ground truthing surveys but was not differentiated in the final ELC, as not all wetlands could be visited, and wetlands are often difficult to classify solely from imagery.

Wetlands within the Project Area accounted for 703 ha, or approximately 12% of the total PA. More information can be found in Appendix D3.

Fauna

Fauna, represented primarily by mammals in insular Newfoundland (since amphibians and reptiles on the Island are all non-native), were chosen as a KI due to their ecological roles, cultural relevance, and regulatory importance. Mammals are central to ecosystem functioning, and their health can reflect the broader state of the terrestrial and aquatic environment.

General mammal surveys undertaken within the PA resulted in the observation of 13 different mammal species. Dedicated muskrat surveys were conducted in the PA and around the Bull Arm site of the LAA in 2024. Several observations of muskrat sign were present within and around the wetlands of the PA and at Bull Arm.

Dedicated surveys were also undertaken for Newfoundland marten (*Martes americana atrata*). All marten traps were placed in suitable mature coniferous forest within the PA. No marten hair samples were obtained from these efforts.

Moose (*Alces alces*) were observed throughout the PA using various habitat types, with a high frequency of sign detected throughout. Canada lynx (*Lynx canadensis*) and Eastern coyote (*Canis latrans*) were regularly observed via tracks in the snow throughout the PA. Lynx was most often observed in the western portion of the PA during late fall and winter surveys. Coyote tracks were observed in the snow, and scent marking was observed throughout. River otter signs were observed in both the PA and RAA.

More specific information on the results of the mammal surveys can be found in Appendix D4.

Avifauna

A comprehensive desktop review was conducted to confirm the range and habitat use of the bird SAR that may occur in the PA. This entailed a literature review of relevant material, including scientific articles, grey literature, SAR registries, and anecdotal databases like iNaturalist. A review was also conducted of the SAR and Species of Conservation Concern (SCC) for the PA through an Atlantic Canada Conservation Data Centre (AC CDC) request.

A comprehensive suite of bird surveys was conducted in the RAA since 2023, and in the LAA and PA since 2024, and continued through the breeding bird season of 2025. Surveys have been conducted throughout the year to include all seasons (winter, spring migration, breeding, and fall migration), and consisted of point counts, ARUs, atlassing transects, raptor sky scans, seabird surveys, and waterfowl surveys.

The PA, LAA, and RAA encompass a diversity of habitat types, and the bird species reflect that landscape mosaic. Rocky barrens, coniferous scrub, wetlands, and mature coniferous forest comprise much of the landscape in the PA, along with some shoreline and open water ponds, lakes and rivers. Subsequently, there are many different species of birds represented, including Anseriformes (waterfowl), Galliformes (gamebirds), Gaviiformes (loons), Accipitriformes (raptors), Charadriiformes (shorebirds), Strigiformes (owls), Caprimulgiformes (nightjars), Coraciiformes (kingfishers), Piciformes (woodpeckers), and Passeriformes (perching birds).

More specific information on the results of the bird surveys can be found in Appendix D1.

Lichens

A comprehensive desktop review was conducted to confirm the ranges of the lichen SAR that may occur in the PA. This entailed a literature review of relevant material, including scientific articles, grey literature, SAR registries, and anecdotal databases like iNaturalist. An Atlantic Canada Conservation Data Centre (AC CDC) data query was submitted to identify any historical records of SAR lichen. This request encompassed the entire PA with a 5 km buffer and included the LAA and part of the RAA. The AC CDC

data request yielded two observations of boreal felt lichen in the RAA, both recorded in 2003, and distant from the PA.

The field survey was conducted opportunistically during other terrestrial field surveys and through lichen-specific surveys in suitable habitats. Lichen-specific surveys took place in September and October 2024. Surveys were conducted throughout the PA and the LAA and RAA. Dedicated surveys were conducted throughout the PA, while the surveys within the LAA and RAA were conducted opportunistically. No boreal felt lichen, vole ears lichen, or blue felt lichen thalli were observed despite intensive surveys in each high and moderate-ranked site identified.

More specific information on the results of the lichen surveys can be found in Appendix D5.

Bats

The AC CDC data request did not yield any results for bats. However, five bat SAR were targeted in this baseline study, as they were all possible for the PA, LAA, and RAA. These included resident bat species (native to NL and year-round inhabitants) - Little Brown Myotis (*Myotis lucifugus*) and Northern Myotis (*Myotis septentrionalis*), as well as migratory bat species (which may occur in NL during migration) - Hoary Bat (*Lasiurus cinereus*), Eastern Red Bat (*Lasiurus borealis*), and Silver-haired Bat (*Lasionycteris noctivagans*).

Extensive bat survey efforts have been ongoing for the Project since 2023 in the RAA and were subsequently expanded to the PA in 2024 and 2025 (and will be ongoing until November 2025). As with the avifauna, it was essential to incorporate efforts in the RAA for bats, given their aerial nature, large home ranges, and migratory life history strategies. Eight detectors were deployed in the RAA in 2023, resulting in 3,337 total bat detections. These data are important for providing a comparison between bat activity in the PA and the broader RAA.

The second phase of the Bats Baseline Study was conducted between April and November 2024. This included desktop research and field surveys aimed at determining the presence/absence of bat SAR in the PA. Three bat detectors were deployed in 2024. From May 8 to October 11, a total of 593 bat calls were recorded across all three detectors, representing relatively low numbers of bat detections from the primarily rocky barren Wind Farm area. In comparison, the eight detectors deployed in the more forested and lower-elevation portion of the RAA recorded a total of 8,918 detections. The relatively low number of detections in the PA, and particularly at the Wind Farm area, indicates that it may be of marginal to low quality to bats. Zero migratory bats were detected in the PA or RAA, and zero from the met tower detector (at 50 m height). Given the rocky nature of the Wind Farm area, and the consistently windy conditions (reducing insect abundance and making flying for bats difficult), it is unsurprising that the

number of bat detections was low. Bat detections were much greater in the RAA, and the habitats were much more suitable for insects and bats.

More specific information on the results of the bat surveys can be found in Appendix D2.

Species at Risk Insects

A comprehensive desktop review was conducted to confirm the ranges and habitat uses of the insect SAR that may occur in the PA. This entailed a literature review of relevant material, including scientific articles, grey literature, SAR registries, and anecdotal databases like iNaturalist. A review was also conducted of the SAR and SCC for the PA through an AC CDC request. There are four insect SAR possible for insular Newfoundland, all protected under provincial and/or federal legislation: the Yellow-banded Bumble Bee (*Bombus terricola*), Gypsy Cuckoo Bumble Bee (*Bombus bohemicus*), Suckley’s Cuckoo Bumble Bee (*Bombus suckleyi*), and the Transverse Lady Beetle (*Coccinella transversogutatta*). Each of these species was targeted in the Rare Insects Baseline Study.

The SAR insect survey was conducted between August and September 2024. This study included desktop research and field surveys designed to assess the presence/absence of insect SAR in the PA. These field studies did not yield any observations of the four insect SAR.

More specific information on the results of the insect surveys can be found in Appendix D7.

4.2.3.3 Project-Environment Interactions

Potential interactions with the identified KIs of the Terrestrial Environment VC are summarized in Table 4.2.3-2. As summarized, there will be a variety of interactions with the Project during all phases. In Section 5.3, a review of the significance criteria and determination of residual effects will be described.

Table 4.2.3-2 Potential Project interactions with Terrestrial Environment.

Project Component and Activity Description	Key Indicators: Terrestrial Environment						
	Flora	Wetlands	Fauna	Avifauna	Rare Lichens	Bats	SAR Insects
Construction							
Site Preparation	X	X	X	X	X	X	X
Roads	X	X	X	X	X	X	X
Staging and Laydown	X	X	X	X		X	
Temporary Batch Plant	X		X	X		X	
Equipment and Materials Transport			X	X			

Project Component and Activity Description	Key Indicators: Terrestrial Environment						
	Flora	Wetlands	Fauna	Avifauna	Rare Lichens	Bats	SAR Insects
Wind Turbine Foundations			X	X		X	
Electrical Infrastructure	X	X	X	X	X	X	X
Wind Turbine Installation			X	X		X	
Hydrogen Generation Plant				X			
Hydrogenation Plant				X			
Toluene and MCH Storage and Transfer				X			
Flare Stacks				X			
Administration Buildings	X		X	X		X	
Temporary Workforce Accommodations	X		X	X		X	
Employment and Expenditures							
Operation and Maintenance							
Wind Turbine Operation			X	X		X	
Wind Turbine Maintenance			X	X		X	
Electrical Infrastructure			X	X		X	X
Venting and Flaring				X		X	
Road Maintenance	X	X	X	X	X	X	X
Hydrogen Generation Plant		X		X			
Hydrogenation Plant				X			
Toluene and MCH Storage and Transfer				X			
Administration Buildings	X		X	X		X	
Employment and Expenditures							
Decommissioning and Rehabilitation							
Electrical Infrastructure	X	X	X	X	X	X	X
Wind Turbines			X	X		X	
Hydrogen Generation Plant				X			
Hydrogenation Plant				X			
Toluene and MCH Storage and Transfer				X			
Terrain Reclamation	X	X	X	X	X	X	X
Temporary Workforce Accommodations	X		X	X		X	
Administration Buildings	X		X	X		X	
Employment and Expenditures							
Accidents and Malfunctions							
Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials	X			X			
Flaring /Venting of Hydrogen and Other Gases				X		X	
Traffic Incidents			X	X			
Fires and Explosions	X	X	X	X	X	X	X
Dislodging of a Wind Tower or Wind Turbine Blade	X	X	X	X	X	X	X
Ice Throw			X	X			
Occupational Hazards and Human Injuries							

Project Component and Activity Description	Key Indicators: Terrestrial Environment						
	Flora	Wetlands	Fauna	Avifauna	Rare Lichens	Bats	SAR Insects
Failure of Industrial Water Supply		X					
Wildlife Emergencies/Incidents			X	X			
Notes X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected.							

Rare Flora

The development of wind energy projects may introduce negative interactions with plants, through the clearing of land, the development of infrastructure, and the alteration of microhabitats with respect to soil, water, and air flow. A recent study concluded that the construction of wind farms may reduce species diversity, functional diversity, and productivity in grassland ecosystems (Zhao et al., 2025). Another study found that the diversity and abundance of rare plant species in proximity to wind turbines are reduced compared to naturalized areas nearby (Urziceanu et al., 2021a). However, plant communities within undisturbed areas adjacent to wind turbine sites appeared to be unaffected (Urziceanu et al., 2021a). Vegetation clearing and road development likely present a greater risk to floral communities than the operation of wind turbines themselves (Urziceanu et al., 2021b). It is well established in literature that the development of roads may result in the introduction of invasive species to a given area (Trombulak & Frissell, 2000), which may pose serious threats to biodiversity (Weidlich et al., 2020). This highlights the importance of minimizing vegetation clearing to the extent possible and replanting with native species in areas that have been cleared.

There is some evidence that air turbulence and vertical mixing from wind turbines affect local microclimates (e.g., temperature, moisture) and influence vegetation growth patterns (Kaffine, 2019). However, the influence of these microclimatic changes on non-agricultural plant species is poorly understood (Kaffine, 2019).

In summary, construction activities pose the greatest potential risk to rare plants, through direct habitat loss, soil compaction, and altered drainage. These effects are anticipated to be negative, low to moderate in magnitude, localized, frequent during construction, and potentially long-term if populations are directly affected; however, they are partially to fully reversible with appropriate avoidance, mitigation, and rehabilitation measures. Indirect effects include changes to microhabitat conditions and the potential introduction of invasive species.

During O&M, effects on plants are expected to be minimal and largely confined to access routes and maintenance areas. Noise, vibration, and light are not expected to affect plant physiology. Decommissioning and rehabilitation may result in short-term disturbance that is localized but should be similar to construction but also provide opportunities for restoration.

Wetlands

Wetlands (i.e., bog, fen, marsh, swamp, and shallow water ecosystems) are found throughout the PA and represent approximately 12% of the total habitat (see Appendix D3: ELC). Wetland ecosystems are vital for the provision of habitat for aquatic and terrestrial species, water regulation and purification, and carbon sequestration. NL has an abundance of wetland ecosystems, primarily in the form of bogs and fens.

Road construction can alter natural water flows throughout wetlands, and surface or subsurface flow alterations may result in the alternate destruction or creation of wetland habitats (Trombulak & Frissell, 2000). In addition, dust generation, erosion, and sedimentation from road construction can alter water quality (Trombulak & Frissell, 2000). Alterations to wetlands can affect overall ecosystem function, which in turn can affect the multitude of species that exist in these habitats (Webster et al., 2014; Mei et al., 2024). Certain species of flora and fauna are specifically adapted to use wetlands, and these species would be most vulnerable to habitat alteration. For example, Quesnelle et al. (2013) studied the effects of habitat loss and alteration on wetland bird species and found that habitat loss is the primary factor in population decline. Project infrastructure will be sited to avoid wetland areas wherever possible.

Fauna

It is likely that mammals will interact with some elements of the Project, as the Construction and O&M phases will create disturbance and habitat fragmentation effects (Colman et al., 2013; Helldin et al., 2012; Schöll & Nopp-Mayr, 2021). The long-term effects of wind turbine development on mammals are not well-studied (Helldin et al., 2012; Schöll & Nopp-Mayr, 2021), but there is some literature available. It is often necessary to reference European findings due to the scarcity of North American studies. Many species and habitats across Europe are similar to those found in Canada, making inferences possible.

There is evidence that the presence of wind turbines has a negligible effect on small mammals such as rodents, shrews, and hamsters (Łopucki & Mróz, 2016; Łopucki & Perzanowski, 2018). However, one study found that common voles (*Microtus arvalis*) at wind turbine sites had increased corticosterone (stress chemical) levels (Łopucki et al., 2018). Notably, the same study found that the striped field mouse (*Apodemus agrarius*) did not exhibit any symptoms of increased stress (Łopucki et al., 2018). Finally, the noise and vibration from wind turbine operations is known to affect the anti-predator behaviour of the European ground squirrel (*Spermophilus beecheyi*) (Rabin et al., 2006).

Wind turbines do not have a measurable effect on the activity and habitat use of moose (*Alces alces*) (Berndt et al., 2021). Similarly, it was found that wind turbines do not have a conclusive effect on the behaviour on semi-domesticated reindeer (*Rangifer tarandus*) (Flydal et al., 2004). Colman et al. corroborate this research, as they theorize that access roads are the main cause of any observed avoidance behaviour (2013). In contrast to these studies, Skarin et al. posit that wind farms influence the calving site and home range selection of reindeer, as they will move away from the sight and sound of wind turbines if possible (2018). While responses to wind turbines differ between species, there is some evidence of a correlation between herbivorous mammals and wind turbine avoidance (Łopucki et al., 2017). This study found that while hare and deer avoided wind turbines, foxes behaved neutrally (Łopucki et al., 2017). This theory can be countered by the observations of Klich et al., who observed that wind farms have no effect on the European hare (*Lepus europaeus*) (2024). Of the various animals studied, including meso-carnivores like the red fox (*Vulpes vulpes*), most did not demonstrate avoidance of wind turbine areas (with the exception of deer and wild boar) (Klich et al., 2024).

For muskrat and other small mammals, construction may result in temporary habitat disturbance, vegetation removal, or localized changes to hydrology near wetlands or drainage features. These effects are expected to be negative, low in magnitude, frequent during construction, localized, short-term, and largely reversible, occurring within landscapes already influenced by natural and anthropogenic disturbance. During O&M, turbines do not present direct interaction or mortality risk to muskrat. Noise, vibration, and light are not expected to meaningfully affect feeding, breeding, or movement patterns. Operational effects are therefore considered negligible to low, localized, and reversible. Decommissioning effects would mirror construction but over a shorter duration, while accidents or malfunctions are unlikely to affect this group beyond localized, short-term disturbance.

Avifauna

Wind energy developments can interact negatively with birds in the form of wind turbine collisions, habitat loss, and disturbance (Garvin et al., 2011), but perhaps less so compared to other forms of anthropogenic infrastructure like buildings and electrical infrastructure (Choi et al., 2020; Calvert et al., 2013; Erickson et al., 2014; Loss et al., 2014a; Loss et al., 2014b). In addition, the effects of disturbance from wind development are likely species-specific, since various studies have resulted in contradictory findings (Schöll & Nopp-Mayr, 2021). Nonetheless, a thorough literature review has been completed to assess the potential effects of wind turbines on the various bird groups present in the PA.

Passeriformes

Passeriformes (songbirds) represent the majority of bird fatalities at wind turbines, with a 2014 study estimating that between 134,000 to 230,000 small passerine fatalities occur annually at wind turbine sites in the United States and Canada (Bayne & Dale, 2011; Erickson et al., 2014). Collisions with tall

anthropogenic structures such as communications towers, buildings, and electrical infrastructure account for millions of songbird fatalities each year (Erickson et al., 2014; Loss et al., 2014a; Loss et al., 2014b). Songbirds not only collide with blades but with the stationary towers of turbines (Choi et al., 2020). Songbird fatalities at wind sites generally peak during spring and fall migrations, with most fatalities occurring during the fall (Erickson et al., 2014; Lloyd et al., 2023).

A recent study concluded that forest-dwelling birds (including passerines) are affected more by changes to habitat quality than by the proximity of wind turbines (Rehling et al., 2023). Indeed, development has been shown to result in both direct and indirect impacts on the activity and behavioural patterns of forest-dwelling birds (Fontúrbel et al., 2021). However, certain factors associated with the presence of wind turbines (e.g., large rotor diameter) may still lead to a partial displacement effect (Rehling et al., 2023). Additionally, it is believed that the loss of wetland ecosystems is the primary factor in the population decline of wetland-dwelling birds (including passerines), and that habitat disturbance has a lesser effect (Quesnelle et al., 2013).

Some songbirds exhibit avoidance behaviour or altered territorial defense behaviour in the presence of wind turbine noise (Lehnardt et al., 2024; Zwart et al., 2015). In the study by Lehnardt et al. the number of songbirds observed in an area decreased by approximately 30% after wind turbine noise was introduced. However, reactions varied based on species and age, with some birds appearing to be unaffected. The most affected demographic were juvenile birds (Lehnardt et al., 2024). Studies on the various effects of wind energy on songbirds have led to contradictory results, likely because effects are species-specific (Marques et al., 2021; Schöll & Nopp-Mayr, 2021).

Raptors

Raptors reproduce at a slower rate than other types of birds. Their offspring, once hatched, may take years to reach maturity. Although raptors have naturally long lifespans that compensate for slow reproduction rates, untimely deaths interrupt this balance, leaving them particularly vulnerable to population decline. In addition, many raptors soar at high elevations to hunt prey and deter other raptors from entering their territory, which can potentially place them in the vicinity of spinning wind turbine blades (Schaub et al., 2024). Soaring heights, behaviours, physiology, and observed responses to wind turbines vary between raptor species and influence the level of effect on a given species (Garvin et al., 2011). Six species of raptor were observed in the PA: Bald Eagle (*Haliaeetus leucocephalus*), Sharp-shinned Hawk (*Accipiter striatus*), Northern Harrier (*Circus hudsonius*), Great-horned Owl (*Bubo virginianus*), Merlin (*Falco columbarius*), and Osprey (*Pandion haliaetus*). Where necessary, studies on the European counterparts of these birds (e.g., the Eurasian Goshawk in place of the American Goshawk) have been used to make inferences on the potential effects of wind energy on raptors found within the PA.

Numerous studies have found that Bald Eagle mortality rates are lower than that of other raptor species, such as the Golden Eagle (Pagel et al., 2013). One study posits that this can be attributed in part to physiological differences; a smaller blind spot and different foraging behaviours can lend Bald Eagles greater visibility when navigating the airspace around wind turbines (Fernández-Juricic et al., 2020). This in turn leads to a lower collision rate. Bald Eagles may be affected by wind turbines in other ways; for example, the construction of a wind farm was observed to alter breeding success in White-tailed Eagles (*Haliaeetus albicilla*) of the same genus, likely due to mortality and territory desertion or displacement (Dahl et al., 2012).

The Northern Harrier appears to demonstrate notable avoidance behaviour towards wind turbines, which can lead to long-term displacement (Shaffer et al., 2019). Consequently, Northern Harriers may have a relatively low mortality rate at wind turbine sites (Shaffer et al., 2019). A recent study on the Eurasian Goshawk (*Accipiter gentilis*) found that the construction of a wind farm and associated power infrastructure resulted in a decline in territory status and the number of breeding pairs present within 3 km of the disturbance (Husby, 2024). Similarly, a higher proportion of the Eurasian Eagle Owl (*Bubo bubo*) abandoned their territory (likely due to either mortality or displacement) within 5 km of a wind farm, with less territory desertion observed farther away (Husby & Pearson, 2022). A case study in southern Spain found that wind turbines were the second highest cause of non-natural mortality in Ospreys (García-Macía et al., 2024).

Many raptor species exhibit avoidance behaviour around wind turbines, and most are at least capable of detecting their presence (Estellés-Domingo & López-López, 2024). Wind farms located on mountain ridges may pose a particular threat to raptors due to their use of orographic lift and tendency to follow prevailing wind currents (Estellés-Domingo & López-López, 2024). In addition, raptors may be at increased risk during periods of high winds or low visibility, when their flight behaviour becomes riskier (Estellés-Domingo & López-López, 2024). In general, wind turbine disturbance can lead to effects such as territory desertion, re-locating nest sites, and a decrease in abundance (Estellés-Domingo & López-López, 2024). One long-term study found that while various raptors were displaced from their territory after the development of a wind farm, some species gradually returned to the site after several years (Dohm et al., 2019). The Sharp-shinned Hawk was among the species whose populations rebounded around seven to eight years after wind turbines had been constructed (Dohm et al., 2019). However, the Northern Harrier and American Kestrel (*Falco sparverius*) did not return to the area (Dohm et al., 2019). The authors theorize that, rather than wind turbine-collision mortality, habitat loss and disturbance is the main cause of raptor population decline near wind turbines. It is important to note that this study was limited to only one wind farm site and a few species, and that site-specific post-construction monitoring programs could be required to determine the response of raptors to a wind farm at another site.

Marine and Freshwater Birds

There is a scarcity of literature regarding the effects of onshore wind turbine development on waterbirds. One study conducted at a wind farm in Pennsylvania on the shores of Lake Erie observed low rates of bird mortality and no waterfowl mortality, although the survey was limited (Ross, 2013). Conversely, a study undertaken in grassland regions in North and South Dakota, U.S.A., found that the majority of wind turbine-related deaths in the area belonged to waterfowl from the family *Anatidae* (ducks) (Graff et al., 2016). The flying heights of many migratory waterbirds increase in altitude during migration, which in turn heightens their susceptibility to wind turbine collisions (Kamata et al., 2023). Waterbirds will likely be affected by wind turbine development in the same manner as other bird species (i.e., through habitat loss, disturbance, and collision mortality) but with a heightened risk during migration.

Avian Species at Risk

The construction of wind turbines leads to habitat fragmentation and disturbance, which negatively affects avian species (Brawn et al., 2001; Fontúrbel et al., 2021). Even resident forest-dwelling birds that are at low risk of collisions with turbines may be affected by habitat disturbance (Fontúrbel et al., 2021). Habitat fragmentation and deforestation are known threats to Red Crossbill *percna* subspecies (*Loxia curvirostra percna*), a bird SAR observed in the PA (COSEWIC, 2016a). Roadways may also threaten this species due to the possibility of vehicle strikes (COSEWIC, 2016a). Red Crossbill *percna* are dependent on conifer forests as their main food source, which puts them in direct competition with the non-native red squirrel (*Tamiasciurus hudsonicus*), another limiting factor affecting their population. The PA is not heavily forested, but where forests do occur, they are predominately coniferous – Coniferous Scrub and Mature Coniferous Forest together comprise approximately 35% of the PA.

Similar to the Red Crossbill *percna*, the Evening Grosbeak (*Coccothraustes vespertinus*) is a forest-dwelling songbird that inhabits Newfoundland year-round. The Evening Grosbeak prefers mature mixedwood forests with fir and white spruce (*Picea glauca*), foraging largely on invertebrates (COSEWIC, 2016b) during the breeding season, and seeds in the winter. Their populations are thought to correlate with the occurrence of spruce budworm (*Choristoneura fumiferana*) (COSEWIC, 2016b). Evening Grosbeak may be affected by habitat disturbance and fragmentation, should development occur in or around the Mixedwood forests found in the PA. COSEWIC lists the loss of mature and old-growth forests, road collision mortality, and possibly the ingestion of sodium chloride at roadsides as the main factors threatening this species (2016b).

The third avian SAR observed was the Short-eared Owl (*Asio flammeus*). This nomadic owl is thought to breed in NL and overwinter in the U.S., although species-specific studies have been limited. Short-eared Owl typically breeds in open habitat (e.g., grasslands, open tundra, drier wetlands) of at least 50-100 ha, preying primarily on small mammals like voles and other rodents (COSEWIC, 2021). Habitat

destruction/alteration and climate change are thought to be the greatest threats to Short-eared Owl populations (COSEWIC, 2021). Short-eared Owls in the PA may be affected by habitat disturbance and fragmentation in suitable habitat (e.g., Rocky Barren, Wetland, and Developed/Disturbed Land ecotypes).

Summary of Project-Avifauna Interactions

During Construction, direct effects on birds are expected to be limited to short-term disturbance and localized habitat alteration resulting from vegetation clearing, increased human activity, vehicle traffic, and elevated noise levels. These effects are anticipated to be negative in nature, low in magnitude, frequent during active construction, localized to the Project footprint and immediate surroundings, short-term, and highly reversible, occurring largely within a broader regional context where similar disturbances are already present. Indirect effects may include temporary displacement from feeding, nesting, or roosting habitats; however, no critical breeding or colony habitats for SAR birds have been identified within the PA.

During O&M, birds may interact with wind turbines through collision risk, with potential mortality varying by species, season, flight behaviour, and flight height. Collision risk is expected to be low in magnitude, periodic, and localized, given the limited use of the PA by high-risk species and the absence of major migratory concentration areas. Nocturnal species such as Leach's Storm-petrel may be attracted to artificial lighting under certain conditions, particularly during low visibility events, which could increase collision risk. Operational noise and vibration may result in minor behavioural avoidance within proximity to turbines but are not expected to result in measurable population-level effects. Effects during operation are expected to be long-term but reversible, with a moderate to high level of mitigation potential through lighting design, operational controls, and post-construction monitoring.

Decommissioning and Rehabilitation effects on birds would be similar in nature to Construction but shorter in duration and spatial extent, consisting primarily of temporary disturbance and noise.

Rare Lichens

Microclimatic effects may affect epiphytic lichens, which are particularly susceptible to changes within the atmospheric environment (Nimis et al., 2002; Pescott et al., 2015). Specifically, these lichens are highly sensitive to air pollution in the form of NO_x and SO₂ (ECCC, 2022; Elsinger et al., 2007). Increased levels of air pollution may lead to the desiccation or mortality of these species (Cameron et al., 2013). Once lichen populations have been negatively affected, they demonstrate a weak capacity for restoration (Weldon & Grandin, 2021). Vegetation clearing will affect many forms of lichen, especially those growing on trees to be felled. However, no lichen SAR were observed during rare lichen surveys in the PA, and there exists only limited habitat suitability for these species throughout.

While the Project will inevitably affect local plant communities, mitigation measures aimed at minimizing vegetation clearing and revegetating disturbed areas will complement the resilience of local ecosystems and ensure that flora and lichens are protected to the extent practicable.

Bats

Thousands of bats collide with wind turbines each year across Canada and the U.S. (Allison et al., 2019). Bat mortalities may increase with the expansion of wind energy in North America (Zimmerling & Francis, 2016). The proximate cause of mortality is blunt force trauma from collision with wind turbine blades (Grotsky et al., 2011; O’Shea et al., 2016; Arnett et al., 2016). Another theory suggested barotrauma as also a cause of death (Baerwald et al., 2008; Brownlee & Whidden, 2011). However, this theory has been scrutinized in recent years, with some scientists remaining skeptical that the blades could generate enough pressure change to cause death by barotrauma (Rollins et al., 2012; Lawson et al., 2018; Lawson et al., 2020).

The phenomenon of high bat mortality at wind turbines has been the subject of intense study, but questions remain about the proximate causes for interaction (Guest et al., 2022). Several studies have shown that bats regularly forage for insects at wind turbines and may be killed during foraging activity (Foo et al., 2017; Horn et al., 2008; Rydell et al., 2010; Rydell et al., 2016). Bats are known to approach and forage near wind turbines on nights with low wind speeds (Arnett et al., 2008; Cryan et al., 2014; Wellig et al., 2018). In addition, some species of bats are susceptible to collisions because of their flight heights during migration, which can line up with the blade swept area of wind turbines.

Little brown myotis (*Myotis lucifugus*) accounts for approximately 13% of bat fatalities at wind turbines in Canada, and Northern myotis (*Myotis septentrionalis*) accounts for about 1% (Zimmerling & Francis, 2016). These bats, both found in the PA, are endangered by a deadly fungal disease known as WNS. This disease can eradicate up to 90% of bat populations in infected hibernacula (Cheng et al., 2021). While WNS is considered the most serious threat to *Myotis* bats, the development of wind turbines may compound this risk and further endanger bat populations on the island. *Myotis* bats are a regionally migrating species and are likely to be affected by wind turbines on a seasonal basis (ECCC, 2018). These bats make small migrations in groups to hibernacula and spring maternity roosts, and it has been observed that a small percentage of bats will move from one hibernaculum to another in the same winter season (sometimes over 100 km away) (COSEWIC, 2013). A recent study reported telemetry data indicating several large movement patterns of female little brown myotis, with one female travelling 375 km over four nights (Sunga et al., 2021). *Myotis* bats typically occupy the vertical stratum from the treetops to the ground, far below the blade swept area, and are not thought to be threatened by wind turbines to the same extent as migratory bats (COSEWIC, 2013). However, much remains unknown about their fall and spring movements to hibernacula, so they could be susceptible to turbine collisions (Roeleke et al., 2016).

Myotis bats may also experience displacement effects from wind turbines. European *Myotis* bats actively avoid the presence of wind turbines in forested areas, which in turn results in habitat loss and displacement (Gaultier et al., 2023). The avoidance distance has been found to increase accordingly with larger rotor diameter (Ellerbrok et al., 2022). The same displacement effect was observed by Scholz et al. (2025) who recommended a buffer zone be implemented between open water habitat and turbines.

Summary Project-Bat Interactions

Bat species potentially occurring in the PA include Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), Hoary Bat (*Lasiurus cinereus*), Silver-haired Bat (*Lasionycteris noctivagans*), and Eastern Red Bat (*Lasiurus borealis*), all of which are SAR due to population declines. During Construction, direct effects are expected to be short-term localized disturbances to foraging habitat resulting from vegetation clearing, increased human activity, and elevated noise levels. These effects are anticipated to be negative in nature, low in magnitude, frequent during active construction, localized to the Project footprint, short-term, and highly reversible, with alternative foraging habitat available in the surrounding landscape.

During O&M, bats are susceptible to turbine-related mortality through blade strikes, with the highest risk in other jurisdictions associated with migratory species such as Hoary Bat, Silver-haired Bat, and Eastern Red Bat during late summer and fall. Operational effects for this Project are expected to be negative, low in magnitude (due to the lack of bat activity or suitable bat habitat in or near the Wind Farm and further confirmed by the lack of detections for migratory species in the area), seasonal and periodic, localized to turbine locations, and long-term in duration. Noise and vibration are not expected to directly affect bats; however, turbine presence could influence movement patterns and foraging behaviour. The mitigation potential is high, with operational curtailment during high-risk periods in real time, monitoring using ultrasonic detectors, and adaptive management measures incorporated into the Avian and Bat Management Plan.

Decommissioning and rehabilitation effects are expected to be similar in nature to Construction but shorter in duration, consisting primarily of temporary disturbance. Accidents or Malfunctions are anticipated to be infrequent and spatially limited, with minimal additional risk beyond normal operational conditions.

SAR Insects

Construction may affect insects through direct habitat loss, vegetation removal, and disturbance of host plants or larval substrates. These effects are expected to be negative, low in magnitude, localized, short-term, and reversible, provided suitable habitat remains available in adjacent areas. Indirect effects may include dust deposition and minor changes in microclimate.

During operation, turbines present minimal direct collision risk for most insect species, although some nocturnal insects may be attracted to lighting. Noise and vibration are not expected to have measurable effects. Operational effects are therefore considered low, localized, and reversible, with mitigation potential through lighting management and habitat protection.

4.2.4 Land and Resource Use

Land and Resource Use (LRU) was selected as a VC because the Project has the potential to interact with other land and resource uses, or cause disruptions to other users, within or near the Project. Additionally, these interactions may result in regulatory or permitting requirements. To identify overlaps in LRU, potential disturbances to LRU and regulatory requirements, five categories of usage were examined - Land Use Planning and Development Control, Industrial and Commercial Land Use, Tourism and Recreation, Harvesting, and Indigenous Land Use.

4.2.4.1 Scope, Measurable Parameters, and Definition of Significant Effects

The spatial boundaries for the assessment of potential LRU effects include the PA, LAA and RAA as defined in Section 4.1.1. Table 4.2.4-1 lists the KIs applicable to the LRU VC, as well as geographic scope and applicable Measurable Parameters for each KI.

An overview of known information on contemporary Indigenous land use, included in Section 3.1.4.5 Indigenous Land and Resource Use, revealed Indigenous land use is absent from the PA and thus has been excluded from the assessment. An overview of known historical information is included in Section 3.1.5, Heritage and Cultural Resources.

Table 4.2.4-1 Scope and Measurable Parameters for Key Indicators: LRU.

Key Indicator	Scope	Measurable Parameter
Land Use Planning and Development Control	PA	<ul style="list-style-type: none"> Qualitative description of property development plans and zoning requirements. Qualitative description of activities affecting land use planning. Extent of current land use sites overlapped by the Project. Change / restriction or disruption of land use (ha).
Industrial and Commercial Land Use	PA	<ul style="list-style-type: none"> Extent of current industrial and commercial sites. Change or disruption affecting other users (ha).
Tourism and Recreation	RAA	<ul style="list-style-type: none"> Presence/location of cabins. Proximity and frequency of usage near Project features. Extent of changes to viewscales.
Harvesting	RAA	<ul style="list-style-type: none"> Nature and level of use by area (e.g., hunting/trapping/angling, domestic wood harvesting). Change/restriction or disruption of land use (ha). Project proximity to harvesting sites (km). Change in accessibility to domestic wood harvesting areas.

Key Indicator	Scope	Measurable Parameter
Indigenous Land Use	RAA	<ul style="list-style-type: none"> Project proximity to contemporary land use areas (km).

The assessment criteria used to determine the effects of the Project on the LRU VC can be found in Table 4.1-4. For the LRU VC, a significant adverse residual effect is defined as having a high magnitude or a medium magnitude and characterized by a high level of frequency and a low level of confidence in the prediction.

4.2.4.2 Baseline Conditions

The Land and Resource Use Baseline Study in Appendix R is summarized in Section 3.1.4 and describes the existing knowledge of the five key indicators - Land Use Planning and Development Control, Industrial and Commercial Land Use, Tourism and Recreation, Harvesting, and Indigenous Land Use.

4.2.4.3 Consultation and Engagement Considerations

During public consultation, participants suggested the transmission line and access road could be combined in one corridor to reduce disturbance to the landscape and heritage trails and move Project infrastructure farther from Sunnyside and recreational users. North Atlantic has modified the Project design to accommodate this suggestion.

4.2.4.4 Project-Environment Interactions

Potential interactions with the identified KIs of the LRU VC are summarized below in Table 4.2.4-2.

Table 4.2.4-2 Potential Project interactions with Land and Resource Use.

Project Component and Activity Description	Land Use Planning and Development Control	Industrial and Commercial Land Use	Tourism and Recreation	Harvesting
Construction				
Site Preparation	X	X	X	X
Roads	X	X	X	X
Staging and Laydown	X	X	X	X
Temporary Batch Plant	X	X		X
Equipment and Materials Transport		X		X
Wind Turbine Foundations	X		X	X
Electrical Infrastructure	X	X	X	X
Wind Turbine Installation			X	X
Hydrogen Generation Plant				
Hydrogenation Plant				
Toluene and MCH Storage and Transfer		X	X	
Flare Stacks				
Administration Buildings	X	X		
Temporary Workforce Accommodations	X	X		
Employment and Expenditures				
Operation and Maintenance				
Wind Turbine Operation			X	X
Wind Turbine Maintenance			X	X
Electrical Infrastructure		X		X
Venting and Flaring				
Road Maintenance		X	X	X
Hydrogen Generation Plant				
Hydrogenation Plant				
Toluene and MCH Storage and Transfer				
Administration Buildings				

Employment and Expenditures				
Decommissioning and Rehabilitation				
Electrical Infrastructure	X	X	X	
Wind Turbine	X		X	
Administration Buildings		X		
Hydrogen Generation Plant		X		
Hydrogenation Plant		X		
Toluene and MCH Storage and Transfer		X		
Terrain Reclamation	X		X	
Temporary Workforce Accommodations				
Employment and Expenditures				
Accidents and Malfunctions				
Spills and Releases		X	X	X
Flaring or Venting Incident				
Fire or Explosion		X	X	
Traffic Incidents		X	X	
Wind Turbine Collapse			X	X
Ice Throw			X	X
Water Supply Failure		X	X	
Wildlife Incident			X	X
Occupational Hazard and Human Injury			X	

Land Use Planning and Development Control

The Project falls within the Municipal Boundaries / Planning Area Boundaries of the Town of Sunnyside and Town of Come By Chance. In Sunnyside, the Project, specifically the transmission line, interacts with five zoning designations including Rural, Public Utility, Town, TCH, and Environmental Protection. All interactions with zoning in Sunnyside are in zones that allow utilities as a permitted use. Therefore, there are no anticipated adverse interactions.

In the Town of Come By Chance, the Project also interacts with five zoning designations including Rural, Mixed Development, Watershed - Refinery, T'Railway Corridor, and Industrial General. Most interactions with zoning occur along the linear features connecting the Wind Farm to the HGP, and within the Industrial General and Watershed – Refinery zones. Within these zones, Industry/Utilities are permitted uses. The only zoning designation that does not allow for Industry/Utilities use is T'Railway Corridor. The Project can avoid such interactions, e.g. by crossing the T-Railway Corridor zone without installing transmission infrastructure within the T'Railway boundaries. Applicable precedents include existing crossings of the T'Railway by the TCH, several utility corridors and an ongoing application for Crown title in the LAA.

In general, the Project will be able to comply with all existing zoning requirements and restrictions during all Project Phases. Municipal planning requirements can be addressed through ongoing engagement with the two municipalities and the development of design changes to the Project, if required. Engaging with the NL Department of Tourism, Culture, Arts and Recreation (NL DTCAR) and the Newfoundland T'Railway Council as appropriate will also serve to identify potential land use conflicts and ensure compliance with regulations.

The PA intersects a protected road - Route 1 Trans-Canada Highway - Terra Nova National Park to Holyrood, which currently has no zoning plan. Roadways without a zoning plan are subject to applicable development regulations where they cross municipal zoning designations. Where a protected road has no zoning plan and is not encompassed by a municipal planning area, Section 6 of the Protected Road Zoning Regulations applies. The Project transmission line is anticipated to cross the protected road within the municipal planning areas of Sunnyside and Come By Chance and thus will require approvals from the two municipalities.

The PA intersects Inkster's Pond water supply. The NL Registry of Water Rights Data shows NARL Refining Inc. has a licence to use water for consumption from Inkster's Pond at Come By Chance (NL DECC, 2025b). This licence has been transferred to Braya. The PA also intersects the Town of Sunnyside Center Cove River Protected Public Water Supply Area. Project infrastructure will be placed to avoid this protected area. Should it be required, an approval would be sought from NL DECC WRMD prior to undertaking any developments within the Protected Public Water Supply Area.

The PA intersects the buffer of an inactive waste disposal site in Sunnyside. This is a provincially defined area rather than a land use zone under municipal regulations. Development in the buffer of a waste disposal site or former waste disposal site does not require a permit but any development requires referral to NL DECC, Pollution Prevention Division and Digital Government and Service NL.

Several parcels of tenured land (e.g., grants, licences, leases, transfers, permissions) are intersected by the PA. While a large portion of the tenured land appears to be in favour of North Atlantic, several are held by other entities. Interactions with these tenured lands can be minimized by avoiding installation of Project infrastructure within their boundaries. If it cannot be avoided, North Atlantic will engage with the owners of these lands to seek agreement on access and utilization. Engagement may also be required with NL MAPA, Land Use Planning regarding Crown lands.

No interactions are anticipated between the Project and Infilling Limits or federal lands. Thus, no effects are expected on these land uses.

Project effects on Land Use Planning and Development Control will be addressed by permits from the appropriate authorities to proceed with construction, or engagement with those who have existing rights on tenured lands. Therefore, Project effects will occur prior to Construction and the Project will not interact with land use planning and development control during O&M or Accidents or Malfunctions. Some minor issues could arise during Decommissioning and Rehabilitation, should the status of land zoning have been altered by that time.

Industrial and Commercial Land Use

With a few exceptions, the lands in the PA (especially around the Sunnyside Wind Farm) are undeveloped. Some Project components are surrounded by the marine waters of Trinity Bay and Placentia Bay, which are both used for a variety of activities including commercial and industrial uses including the Sunnyside and Arnold's Cove fishing harbours. As there are no marine commercial uses in the PA, there are no anticipated interactions.

Several potential wind energy projects are proposed in eastern Newfoundland. The PA intersects Wind Energy Land Reserves identified for Toqlukuti'k Wind and Hydrogen Ltd., along with those of North Atlantic's Wind Hydrogen Hub. Engagement and coordination with Toqlukuti'k Wind and Hydrogen Ltd. is planned to address the limited area of the Project that overlaps with the Toqlukuti'k Wind and Hydrogen project. This dialogue will serve to avoid any potential conflict of infrastructure between the two projects. Engagement may also be required with NL IET, which oversees interests in wind and hydrogen development.

The PA intersects 11 Crown titles (i.e., leases, grants or permissions), which are sections of utility corridors. These titles are held by NLH and Labrador-Island Link Limited Partnership. Engagement with NLH and Labrador-Island Link Limited Partnership will address any potential land use conflicts and ensure that the Project and the utilities successfully access lands in the area.

The Project is located within two FMDs. The Project transmission line portion of the PA intersects small portions of two domestic harvest blocks but no commercial harvesting areas.

Road transport of wind turbine components has the potential to produce temporary traffic delays which may affect traffic to industrial and commercial operations in the PA. This interaction is anticipated to be minimal and temporary during shift changes and during movement of wind turbine components. A Traffic Management Plan has been developed to address means to reduce interactions and ensure the smooth flow of road traffic (Appendix E).

There are no mineral exploration licences or mining leases within the Project Area (PA), though the Duck Pond Mine Area is noted in the broader Regional Assessment Area (RAA). While 11 quarry permits exist across the Local and Regional Assessment Areas, none intersect the PA. Therefore, no interactions are anticipated between the Project and mining (i.e., mineral exploration licences or mining leases) and quarry lands. However, four mineral licences overlap the Wind Farm area. North Atlantic will continue to work with mineral rights holders in the area; licence holders have been contacted, and agreements will be arranged if needed to address any potential effects.

Any temporary disturbance to nearby properties will be limited to the Construction, and Decommissioning and Rehabilitation Phases. During the O&M Phase, levels of disturbance will be minimal. Given the existing zoning of the Project, which ensures compatible uses, there is minimal potential for Project activities to disrupt existing industrial and commercial resource uses.

Tourism and Recreation

Potential concerns could arise with tourism and recreation and the Project because of interactions with noise/vibration, ice throw and potential reduction in access and/or land quality.

Several cabins have been identified within the PA, LAA, and RAA. Due to the nature of noise during the Construction Phase and based on the review of noise effects in the Noise Impact Study, there will be interactions between cabins and noise from construction of wind turbines. Mitigation measures will be applied as appropriate to avoid or greatly reduce the effects of construction noise.

Another potential interaction is with ice throw from the wind turbine blades and nearby cabins during the O&M Phase of the Project. In the Ice Throw Assessment, it has been determined that there are potential

interactions with ice throw and two potential cabins located near wind turbines 9 and 48. However, further engagement from North Atlantic confirmed that for the potential cabin area near wind turbine 9, there is no license to occupy or Crown land claim and the structure in the area has collapsed. There is a license to occupy for the cabin area near wind turbine 48, however North Atlantic has verbal confirmation that the owner does not intend to build in this location and there is no existing structure there. As such, the wind turbine locations that overlap with these potential cabin areas do not present any current or anticipated interaction.

Other potential tourism and recreation land uses include the T'Railway Provincial Park and the Come By Chance Estuary ('the Gut'), known for its birdwatching opportunities. Effects on these land uses would be temporary in nature and limited to the Construction Phase of the Project, when temporary reduced access to these areas could occur. The Project will also change the visual landscape of the PA, LAA and RAA following the construction of the wind turbines. This change to the visual landscape may alter the tourism and recreation use of the area.

Within the LAA and PAA, there are six trailheads – Otter Rub/War Path, Bordeaux Hiking Trail and Aurthur's Hill Trail in Arnold's Cove, Cleary Hiking Trail in Come By Chance and Truce Sound Coastal Trail and Centre Hill Trail in Sunnyside. As these trailheads do not interact with Project components, no direct interactions are anticipated.

There are no interactions between the Project and outfitting operations (e.g., camps, lodges, cabins and/or related facilities and services for sport angling/fishing, hunting or other recreational activities). Thus, no effects are expected on these land uses.

The disturbances noted above during the Construction and O&M Phases of the Project will be greatly reduced by the implementation of mitigation measures. Mitigation measures are discussed further below and in the Noise Impact Study (Appendix J) and the Ice Throw Assessment (Appendix L).

Harvesting

The Project overlaps with various harvesting areas, including hunting management areas (such as Black River, Bonavista Peninsula, and Bellevue), trapping zones, angling sites, small game management areas, and domestic wood harvest blocks located within the PA, LAA, and RAA. While these management areas encompass the broader assessment areas, they do not specifically cover high-use zones. Although recreational use of the wind turbine placement area appears low, the small survey sample limits confidence in this conclusion. Interactions with linear infrastructure, such as access roads and transmission line ROWs, are expected to be more frequent than for the wind turbine sites themselves because they cross through areas more frequently used by cabin owners and lead to domestic woodcutting zones via established ATV trails. Anticipated interactions during the Construction Phase are

expected to be temporary and may limit access to some land uses; however, survey results suggest limited current use, with only two of eight respondents indicating engagement in harvesting activities, suggesting minimal effects overall.

The PA does not intersect any of the designated salmon rivers and as such, no effects are anticipated.

Project infrastructure will reduce the availability of quality land for domestic wood harvesting due to ongoing vegetation management within rights-of-way. This, along with clearing for infrastructure removal, may alter recreational and subsistence land use along transmission lines and roadways by affecting access to and availability of natural resources. However, disturbed areas will be restored and rehabilitated, as needed, to support the continued use of these areas for subsistence land-based activities.

Indigenous Land Use

There are no Indigenous land claims on the island; however, FSC licenses granted to members of the Miawpukek First Nation (MFN) cover a substantial marine area, including the coastal waters of Bay d'Espoir and the NAFO Division 3Ps. This area extends from Placentia Bay westward to Burgeo, providing MFN members access to a diverse range of marine resources. The FSC licenses support sustainable harvesting of fish, shellfish, trout, and seals, contributing to the community's economic and cultural well-being. Although there is an adjacent fishing license/enterprise to the PA, no information is available to determine if FSC fishing occurs in the Placentia Bay. It is anticipated that the Project will have little if any interaction, and hence no effect on this KI.

4.2.5 Heritage and Cultural Resources

Heritage and Cultural Resources are included as a VC because they are valued by society for the general and scientific information they can provide about past peoples, their societies, cultures, and lifeways, and the connections and interactions they may have had with other groups.

4.2.5.1 Scope, Measurable Parameters, and Definition of Significant Effects

The KIs presented in Table 4.2.5-1 for this VC include Historic and Archaeological Resources protected under the **Historic Resources Act** (1985). Historic resources refer to natural or human-made works that hold value due to their archaeological, prehistoric, historic, cultural, natural, scientific, or aesthetic significance. These may include sites, structures, or objects that provide insight into prehistoric or historic human activity.

Table 4.2.5-1 Scope and Measurable Parameters of Key Indicators: Heritage and Cultural Resources.

Key Indicator	Scope	Measurable Parameter(s)
Historic and Archaeological Resources	PA	A change in the number of registered archaeological sites identified within the PA; a change in the number of registered provincial cultural resource sites within the PA; the extent of overlap (km ²) or number of HPAs identified within the PA.
Architectural Resources	PA	A change in the number of registered heritage structures identified within the PA; a change in the number of Municipal Heritage sites identified within the PA.
Palaeontological Resources	PA	A change in the number of registered palaeontological sites identified within the PA.

Archaeological objects generally consist of materials such as stone tools, ceramics, glass, and metal artifacts, as well as structural remains (e.g., wooden or stone features) that are at least 50 years old and show evidence of human manufacture, use, or modification. This KI also includes human remains and burial, cultural, spiritual, and other heritage sites or artifacts from both the Pre-contact and Historic periods.

Another KI for this VC is Architectural Resources, which typically consist of buildings or structures of historical significance that have been recorded and registered with Heritage NL) through the NL DTCAR, or designated as Municipal Heritage Sites by the Town of Sunnyside.

The Heritage and Cultural Resources VC also encompass Palaeontological Resources (fossils) which refer to a construct, structure, or work of nature consisting of or representing evidence of prehistoric multicellular organisms, including palaeontological resources designated by regulation under the **Historic Resources Act** (1985).

A custom list of criteria was used to evaluate the effects of the Project on the Heritage and Cultural Resources VC. Some of the generic criteria presented in Table 4.1-4 have been modified for applicability to this VC, whereas other criteria are not applicable to the Heritage and Cultural Resources effects assessment, as noted in Table 4.2.5-2 below.

Table 4.2.5-2 Assessment criteria: Heritage and Cultural Resources.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Negligible – no perceptible effect on the integrity and/or quality of a Heritage and Cultural Resource.
	2	Low - disturbance of a Cultural and Heritage Resource is predicted; however, the integrity and/or quality of the resource can be fully preserved.
	3	Medium – some disturbance or loss occurs to a portion of a Cultural and Heritage Resource and its associated information that is of interest and concern to the associated community.
	4	N/A

Evaluation Criteria	Rating	Descriptor
	5	High – Complete disturbance or loss of a Cultural and Heritage Resource, with no retrieval of the resource and its associated information.
Frequency		Not applicable. An effect on Heritage and Cultural Resources occurs only once (i.e., disturbance results in the loss of context).
Geographic Extent		Any extent is limited to specific Heritage and Cultural Resource site or HPA.
Duration		Not applicable. Heritage and Cultural Resources are static and finite; therefore, residual effects are always permanent, with no return to pre-existing conditions.
Reversibility		Not applicable. Any residual effect is not reversible.
Historical or Cultural Context	1	Undisturbed - Area is relatively undisturbed or not adversely affected by human activity.
	2	N/A
	3	N/A
	4	N/A
	5	Disturbed – Area has been substantially previously disturbed by human development or human development is still present.

According to the **Historic Resources Act** (1985), a significant residual adverse effect on Heritage and Cultural Resources is defined as a residual Project-related change to the environment that results in the unauthorized disturbance or destruction of a Heritage and Cultural Resource that is determined by the Provincial Archaeology Office (PAO), to be historically, archaeologically, or culturally significant and that cannot be mitigated.

4.2.5.2 Baseline Conditions

A Historic Resources Overview Assessment (HROA) was prepared in accordance with the requirements of the PAO, as summarized in Section 3.1.5. The PAO serves as the central repository for all historic resource records in NL. As part of the assessment, the list of registered archaeological and palaeontological sites, provincial cultural resource sites, and registered heritage structures was reviewed.

One registered archaeological site was documented within the PA. There are no known or registered fossils in the PA (and the potential for them to be present is low due to the geological composition of the region); therefore, Palaeontological Resources were not assessed further. There are currently no provincially registered heritage structures or municipal heritage sites within the PA; therefore, Architectural Resources were not assessed further.

In addition, a desktop evaluation of the PA was conducted to assess the likelihood of encountering archaeological materials at previously un-surveyed locations. Areas with the highest likelihood were identified as HPAs, and the extent of their overlap with proposed infrastructure within the PA was evaluated. Twenty HPAs were identified within the PA during the HROA.

4.2.5.3 Consultation and Engagement Considerations

The Study Team complied with the Indigenous engagement requirements that are outlined in the Government of NL Aboriginal Consultation Policy on Land and Resource Development Decisions. On March 12, 2025, CRM Group contacted Miawpukek First Nation by email and requested any available information pertaining to traditional or historical Indigenous use of the Study Area (K. Cigolotti, personal communication, 12-Mar-25). As of completion of the HROA and HRIA reports, no response has been received.

4.2.5.4 Project-Environment Interactions

Historic or Archaeological sites and materials could be lost or disturbed by the Project. The Project Phase of most concern is Construction, when the greatest extent of physical disturbance to the landscape will occur. Activities such as site preparation, construction of roads, and establishment of wind turbine foundations all involve potentially disruptive aspects. During the O&M Phase, there will be few potential interactions due to the nature of Project activities. Decommissioning and Rehabilitation will mirror Construction regarding physical disturbance, albeit with far less potential for site disturbance. A limited number of Accidents and Malfunctions are candidates for interaction with Heritage and Cultural Resources. Potential interactions with identified KIs of the VC are listed in Table 4.2.5-3.

The HRIA resulted in the identification of one HPA (HPA-04) within the PA, in addition to a registered site CIAk-02 (HPA-12). Potential interactions with these sites could occur from access road, power line, or wind turbine construction and/or upgrading (see Figure 3.1.5-2). The other location ascribed high archaeological resource potential (HPA-05) is located near waterbodies and lies beyond the defined footprint of potential Project effects. If avoidance of the remaining portion of HPA-04 is impractical, it is required that planned Project development areas that overlap this area zones of high archaeological resource potential, be subjected to the Archaeological Mitigation phase of an HRIA.

Despite the lack of specific potential for archaeological sites surrounding the HPAs, the entire region contains ethnographic potential. Furthermore, despite the lack of identification of campsites or archaeological material during the HRIA field activities, the likelihood of discovery of archaeological resources throughout the course of the ground-disturbing activities is still possible. As such, a detailed Contingency Plan is included within Appendix F. This includes information on the identification of historic resources during construction and development, and protocols to follow in the rare instance of encountering historic resources during construction.

Table 4.2.5-3 Potential Project interactions with Heritage and Cultural Resources.

Project Component and Activity Description	Key Indicators: Heritage and Cultural Resources
	Historic and Archaeological Resources
Construction Phase	
Site Preparation	X
Roads	X
Staging and Laydown	X
Temporary Batch Plant	
Equipment and Materials Transport	
Wind Turbine Foundations	X
Electrical Infrastructure	X
Wind Turbine Installation	
Hydrogen Generation Plant	X
Hydrogenation Plant	X
Toluene and MCH Storage and Transfer	
Flare Stacks	
Administration Buildings	
Temporary Workforce Accommodations	
Employment and Expenditures	
Operation and Maintenance	
Wind Turbine Operation	
Wind Turbine Maintenance	X
Electrical Infrastructure	X
Venting and Flaring	
Road Maintenance	X
Hydrogen Generation Plant	
Hydrogenation Plant	
Toluene and MCH Storage and Transfer	
Administration Buildings	
Employment and Expenditures	
Decommissioning and Rehabilitation	
Electrical Infrastructure	
Wind Turbines	
Hydrogen Generation Plant	
Hydrogenation Plant	
Toluene and MCH Storage and Transfer	
Terrain Reclamation	X
Temporary Workforce Accommodations	
Administration Buildings	
Employment and Expenditures	
Accidents and Malfunctions	
Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials	

Project Component and Activity Description	Key Indicators: Heritage and Cultural Resources
	Historic and Archaeological Resources
Flaring /Venting of Hydrogen and Other Gases	
Traffic Incidents	
Fires and Explosions	
Dislodging of a Wind Tower or Wind Turbine Blade	
Ice Throw	
Occupational Hazards and Human Injuries	
Failure of Industrial Water Supply	
Wildlife Emergencies/Incidents	

4.2.6 Socio-economic Environment

This section includes the effects assessment for the socio-economic environment which includes two valued components (VCs) – Communities and Economy, Employment and Business. The Communities VC is included because community services and infrastructure and community health and wellbeing could be affected by the Construction, O&M and Decommissioning and Rehabilitation Phases of the Project. For the Economy, Employment and Business VC, economic conditions such as major industries, employment and business may be affected by the Construction, O&M and Decommissioning and Rehabilitation Phases of the Project.

The spatial boundaries for the assessment on Communities and Economy, Employment and Business effects include the PA, LAA and RAA as defined in Section 3.1.3.6.

The temporal boundaries for this assessment include three major Project Phases: Construction (29 months), O&M (nominally 30 years), and Decommissioning (one year). Temporal boundaries therefore extend from 2025 to 2058.

4.2.6.1 Scope, Measurable Parameters, and Definition of Significant Effects

The Communities VC includes three KIs - population demographics, community health and wellbeing and infrastructure and services, while the Economy, Employment and Business VC includes economy, employment and business as KIs. These KIs and applicable measurable parameters for each are listed below in Table 4.2-1.

Table 4.2.6-1 Scope and Measurable Parameters of Key Indicators: Socio-economic Environment.

Valued Component	Key Indicator	Scope	Measurable Parameter
Communities	Population Demographics	Socio-Economic RAA	<ul style="list-style-type: none"> Population trends Age Diversity
	Community Health and Wellbeing	Socio-Economic RAA	<ul style="list-style-type: none"> Health status Education Income Food security
	Infrastructure and Services	Socio-Economic RAA	<ul style="list-style-type: none"> Housing and accommodations Health and social services Education and training Transportation Municipal/Regional Infrastructure and Services Utilities and communications Prevention and emergency services Recreation
Economy, Employment and Business	Economy	Socio-Economic RAA	<ul style="list-style-type: none"> GDP Tax revenue
	Employment	Socio-Economic RAA	<ul style="list-style-type: none"> Labour supply Employment equity and diversity
	Business	Socio-Economic RAA	<ul style="list-style-type: none"> Business organizations Industrial parks Capacity and growth

A significant effect on the Communities VC is defined as an adverse residual Project-related effect to the socio-economic environment that results in either, or both, of the following:

- Long-term effects to community health and well-being, which cannot be managed through planned Project mitigation measures; or
- Long-term exceedance of available capacity, or a substantial decrease in quality of infrastructure or services, which cannot be managed through planned Project mitigation measures.

A significant effect on the Economy, Employment and Business VC is defined as an adverse residual Project-related effect to the socio-economic environment that results in:

- A measurable change distinguishable from current conditions, lasting beyond the life of the Project, and cannot be managed through planned Project mitigation measures.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect (e.g., where modelling was undertaken).

4.2.6.2 Baseline Conditions

The Socio-Economic Baseline study in Appendix G is summarized in Section 3.1.6 describes the existing knowledge of the six key indicators – Population Demographics, Community Health and Wellbeing, Infrastructure and Services, Economy, Employment, and Business.

4.2.6.3 Consultation and Engagement Considerations

During stakeholder engagement activities, including community consultations, no concerns have been identified with respect to socio-economic conditions.

4.2.6.4 Project-Environment Interactions

Potential interactions with the identified key indicators of the socio-economic environment KIs are summarized below in Table 4.2.6-2. For both VCs it is anticipated the potential effects of the Project would be similar regardless of the specific component of the Project. Thus, the Project components have been removed from the table below and the Project phase has been used instead. Further, accidents and malfunctions are unlikely to result in changes to either VC and are not reviewed further as part of this effect assessment.

Table 4.2.6-2 Potential Project Interactions with Socio-economic Environment.

Project Component and Activity Description	Key Indicators: Socio-economic Environment					
	Population Demographics	Community Health and Wellbeing	Infrastructure and Services	Economy	Employment	Business
Construction	X	X	X	X	X	X
Operation and Maintenance	X	X	X	X	X	X
Decommissioning and Rehabilitation	X	X	X	X	X	X
Accidents and Malfunctions						
<u>Notes</u> X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected						

Population Demographics

The Project may result in temporary or permanent increases in population, which vary by Construction, O&M and Decommissioning and Rehabilitation Phases of the Project. Population increases are generally considered to be positive in rural communities with population decline and ageing resulting in low or negative growth. Other than Come By Chance, all other locations in the LAA and RAA had small

population increases in the last census. Although some services and infrastructure may be limited in these communities, capacity likely exists in those services available due to small populations. The Project may have a positive effect on the communities due to employment opportunities and the possibility of retaining and/or gaining new permanent residents. This may also result in a younger and more diverse population.

It is anticipated that the current population in the LAA will not be able to supply sufficient labour for the Project during the Construction Phase as approximately more than 1,200 full-time equivalents will be required over the course of the entire Construction Phase (Appendix Q, Workforce and Employment Plan). While there may be opportunities for permanent employment and some workers from the Construction Phase may gain employment with the Project during O&M, it is also likely that the 30-year operational period will attract other non-residents (depending on skill set) from the LAA and RAA to relocate for permanent work opportunities.

The Decommissioning and Rehabilitation Phase may require the support of a non-resident labour force in a manner similar to the Construction Phase. Following Decommissioning and Rehabilitation activities, permanent population may decline due to fewer temporary and permanent employment opportunities with the Project.

Community Health and Wellbeing

A Light Impact Assessment was undertaken for this Project. The assessment has determined that light levels at the identified sensitive receptors are below the limits recommended by the Institution of Lighting Engineers guidelines both before and after 11pm. Further, the closest receptors to the wind turbines, HGP and HP Plant are 371 m, 2,926 m and 1,448 m. respectively. However, further engagement from North Atlantic confirmed that for the potential cabin area near wind turbine 9, there is no license to occupy or Crown land claim and the structure in the area has collapsed. There is a license to occupy for the cabin area near wind turbine 48, however North Atlantic has verbal confirmation that the owner does not intend to build in this location and there is no existing structure there. As such, the wind turbine locations that overlap with these potential cabin areas do not present any current or anticipated interaction.

Several cabins have been identified within the LAA. Due to the nature of noise during the Construction Phase and based on the review of noise effects in the Noise Impact Study, there will be interactions between the cabins and the noise from construction of the wind turbines. Mitigation measures are recommended to be implemented as part of the Project to greatly reduce the effects of construction noise.

Another potential interaction is with ice throw from the wind turbine blades and nearby cabins during the O&M Phase. In the Ice Throw Assessment, it has been determined that there are potential interactions between ice throw and two cabins located near wind turbines 9 and 48. However, as mentioned above,

no Crown land license to occupy or application exists near turbine 9. A license to occupy exists near turbine 48, but the owner has no plans to build. As such, the wind turbine locations that overlap with these potential cabin areas do not present risk for the foreseeable future.

Based on the results of modelling prepared for Section 4.1.2, the Project is not anticipated to result in adverse health effects due to dust, light, noise, vibrations or ice throw during the Construction, O&M or Decommissioning and Rehabilitation Phases. Installation and operation of the Wind Farm will result in a change to the viewscape, especially at Sunnyside. Based on community input, Project design changes have included moving the transmission line north to align with the access road away from Sunnyside and recreational areas. A 3D rendering of the PA is available here: <https://experience.arcgis.com/experience/60fc2e3478ae491cbd3273f5c4834b7a>

The Project will result in opportunities for employment, both short-term during Construction and long-term during O&M, which may require formal education or on-the job training. These opportunities may enhance the ability of workers to engage in employment that provides higher income and employment benefits, which could result in better quality of life for individuals and families. Higher education and secure income reduce poverty and related issues such as food insecurity.

Infrastructure and Services

Short-term and long-term population increases or decreases can be drivers of changes to the availability and capacity of infrastructure and services. The Project is expected to have both temporary and long term changes to population, which may affect the usage and capacity of infrastructure and services. The type and degree of changes depend on the number of individuals, Project phase and type of infrastructure or service.

Housing and accommodations can be affected by development projects if non-residents workers are left to find housing in communities or in hotels/short-term accommodations. While such arrangements are beneficial to those who own rental facilities, the presence of a non-residents workforce can result in increases in market rental housing prices for residents and incentivize conversion of housing for workers resulting in housing shortages for residents who live in market rental housing.

To avoid potential housing issues in the communities and given the short-term nature of construction work, it is possible that non-resident workers could take advantage of the temporary accommodation facilities at the Bull Arm Fabrication Site during the Construction Phase. While not all workers or Project-related personnel will use the worker accommodations, this mitigation measure would serve to reduce effects on housing. Any shortages or price increases in rental housing should stabilize during O&M as the non-resident construction workforce will no longer be present. It is anticipated that, due to the smaller

number of O&M employees, any non-resident or visiting workers would not adversely affect rental housing.

The presence of a non-resident workforce could possibly contribute to shortages of health services. Recent studies show that in NL the availability of a regular health care provider is slightly lower than the Canadian average. A temporary increase of workers, especially during the Construction Phase, has the potential to affect access to health services either through routine appointments or due to injuries. This is offset by the fact that the three-year Construction Phase would be a short-term effect. Following Construction, demand for health services is likely to stabilize during O&M. Provision of health and safety resources for the Project can result in convenient access for workers and reduce potential incidents. Further, following Decommissioning and Rehabilitation, demand for services is likely to return to pre-Project conditions.

Workers may require education or trades training to gain employment with the Project. This could result in increased demand at colleges such as those in Clarenville and throughout the LAA. Public and private colleges and other educational institutions monitor changes and adjust programs based on needs and opportunities. Further, North Atlantic can work with educational institutions to address the needs of the Project by providing Project information and updates.

The Project has the potential to result in increased road traffic, especially at peak times such as shift changes. Daily worker transportation will be reduced by housing non-resident workers at an accommodation facility. North Atlantic has undertaken a Transportation Impact Study and Traffic Management Plan for the Project (Appendix E). The Traffic Management Plan outlines intended measures for Construction activities including traffic management, driver guidelines and traffic control measures. With these mitigation measures, it is anticipated that effects to the road network during Construction will be minimized.

The population is expected to increase temporarily during Construction. Thus, an increase in demand for services and infrastructure such as water and sewer could be anticipated. However, it is possible that non-resident workers could take advantage of the temporary accommodation facilities at the Bull Arm Fabrication Site which will have its own water and sewer services. This would result in minimal effect on water and sewer infrastructure during Construction.

During the Construction and Decommissioning and Rehabilitation Phases, it is anticipated that there will be a high volume of solid waste produced by the Project. As producers of industrial / commercial/institutional (ICI) waste engage management services in the private sector, it is not anticipated that there will be effects to any residential collection or waste management in the LAA. North Atlantic has prepared a Project-specific Waste Management Plan (Appendix N). North Atlantic currently has an Environmental Management Standard Operating Procedure which includes waste management

practices. These practices include the waste management principles of reduction, reuse, recycling and recovery before disposal. As Robin Hood Bay Regional Waste Management Facility is the only one in the RAA that accepts ICI waste, North Atlantic will work with the operators of Robin Hood Bay to address waste diversion and disposal.

The Project will generate its own electricity supply but will need intermittent access to supplementary sources to improve reliability. Electricity in the RAA is provided by NLH and Newfoundland Power via a system dominated by hydroelectric generating facilities and supplemented by thermal generation (Holyrood). The Project will develop a new 138 kV transmission line from the Wind Farm to the HGP. Further, a separate grid feed will supply additional power to the HGP and HP substation from the Sunnyside substation owned by NLH.

The Project will require support services for potential emergencies during Construction and O&M. A 2015 review of fire protection services determined that of the five municipalities in the LAA, only the Towns of Arnold's Cove and Clarenville had "Acceptable" offensive interior and defensive exterior ratings. The Towns of Sunnyside, Come By Chance and Southern Harbour had either "Needs Improvement" or "Unacceptable" ratings. North Atlantic has prepared an Emergency Response Plan (Appendix M) and have an Emergency Response Team to manage emergencies such as fires. Further to this and given the locations of the HGP and HP in the Town of Come By Chance, North Atlantic will engage with the municipality to discuss increasing the capacity of the fire departments to manage potential emergencies.

The Project is not anticipated to affect recreation infrastructure and services in the LAA or RAA during the Construction and Decommissioning and Rehabilitation Phases. A potential increase in permanent population during O&M could result in demand for additional recreation infrastructure and services in the LAA, however capacity is likely available to accommodate any permanent population increase due to the Project. Following Decommissioning and Rehabilitation, utilization of infrastructure and associated services are likely to return to pre-Project levels.

Economy

It is anticipated that the Construction and O&M Phases of the Project will provide the most positive effects to the economy in the LAA and RAA. During the Construction Phase, there will be a large expenditure on procurement of construction contracts as well as goods and materials. This will result in a positive contribution to GDP and taxation.

During O&M, it is expected that there will also be a positive, but smaller, contribution to GDP and tax revenue. The Project will result in spending on goods and services to maintain O&M of the Project throughout its timeline.

The Decommissioning and Rehabilitation Phase of the Project is also projected to contribute to GDP and tax revenue but at levels below those experienced during Construction. Following closure, economic effects will be reduced due to fewer opportunities.

Employment

The Project will create new opportunities for employment in renewable energy and supporting sectors with an estimated 1,200 full-time positions during Construction Phase and approximately 62 full-time positions in the 30-year Operation Phase. North Atlantic will employ a combination of direct hires and contractors, with an emphasis on local hiring and diversity and inclusion in keeping with Government directives and company policies (Appendix Q, Workforce and Employment Plan). The Project may face labour challenges with the expected loss of 2.3% of construction workers in the province by 2033 (BuildForce Canada, 2024). Also, with the number of workers needed for the Project and the emphasis on diversity and inclusion, an employment opportunity will be presented to underrepresented workers such as women, Indigenous and immigrant workers.

With several large capital projects being developed in the province and increase employment in the non-residential construction sector from 2022 to 2023 (BuildForce Canada, 2024), it is anticipated that the Project will attract both local and non-resident workers. Further, given the nature of wind farm and plant operation, many specialties will be required, which could also require specialised training.

The Decommissioning and Rehabilitation Phase of the Project may require the support of a resident and non-resident labour force but smaller than labour requirements for Construction.

Business

Within the LAA are numerous industrial and business services, as well as transportation, storage and logistics, safety and security, marine services, consulting and engineering services, construction, travel, accommodations and food services. With the expected increase in workers being drawn to the area and the need for business services, it is anticipated that businesses in the LAA will see an increase in opportunities. This is mainly expected during the Construction and O&M Phases of the Project. During the Project Decommissioning and Rehabilitation Phase, it is anticipated that there will continue to be business investment, however, once the Project is complete the growth may cease. This is offset by the potential new capacity of these business due to the investment through the lifetime of the Project, which may provide new business opportunities.

4.2.7 Human Health and Quality of Life

This section considers the effect of the Project on the Human Health and Quality of Life VC, which may be affected by issues associated with Construction, O&M, and Decommissioning and Rehabilitation

Phases of the Project. The interaction between the Human Health and Quality of Life VC and the Project occurs through eight key aspects: air quality, light, noise, vibration, shadow flicker, and ice throw, land and resource use, and tourism and recreation.

4.2.7.1 Scope, Measurable Parameters, and Definition of Significant Effects

Baseline conditions and Project interactions for key components such as air quality, light, noise, and vibration are discussed in the Atmospheric Environment section (4.2.1). Human Health and Quality of Life may be indirectly affected by other Project interactions, such as those discussed in the Land and Resource Use section (4.2.4), including land use planning and development control, industrial and commercial land use, and harvesting. Additionally, Project interactions with Indigenous land and resource use, detailed in Section 4.2.4, may also affect Human Health and Quality of Life.

Given the material presented in sections 4.2.1 and 4.2.4, this section addresses the remaining concerns - shadow flicker and ice throw. Table 4.2.7-1 lists relevant KIs for the Human Health and Quality of Life VC, showing where each is addressed in other sections of the Registration. The geographic scopes for shadow flicker and ice throw were established in the respective studies resulting in specific peripheral distances for each.

Table 4.2.7-1 Scope and Measurable Parameters of Key Indicators: Human Health and Quality of Life.

Key Indicator	Scope	Measurable Parameter
Air Quality	See Section 4.2.1	
Greenhouse Gases		
Light		
Sound Quality		
Vibration		
Shadow Flicker	2,044 m radius from each wind turbine site	Shadow hours
Ice Throw	421.5 m from each wind turbine site.	Ice throw distance

4.2.7.2 Baseline Conditions

Section 3.1.1 (Atmospheric Environment) provides an overview of the current understanding of ambient light conditions in the RAA. Appendix K (Shadow Flicker Analysis) explains the concept of shadow flicker caused by wind turbines and Appendix L (Ice Throw Analysis) explains ice throw in detail.

Shadow Flicker

Shadow flicker occurs when the rotating blades of wind turbines cast moving shadows on nearby structures. This typically happens when the sun is low in the sky, during early morning or late afternoon, and the wind turbine is positioned between the sun and a receptor. The flickering effect can be disruptive to those receptors of shadow flicker living or working in affected areas.

Ice Throw

At a wind power facility, ice can form on various structures such as buildings, power lines, roads, walkways, stairs, wind turbine components (e.g., towers, nacelles, hubs, blades), weather masts, and other structures (Canadian Renewable Energy Association, 2020). Ice throw occurs when ice forms on the blades of wind turbines and is thrown off as the blades rotate. This ice can be propelled considerable distances, posing risks to nearby structures, vehicles, and individuals. Ice fall, on the other hand, occurs when ice fragments detach from the wind turbine while the blades are paused or idle. Both phenomena typically occur when temperatures rise rapidly from below freezing or fluctuate near 0°C. Additionally, ice throw may happen when wind turbines resume operation following a pause during an icing event.

4.2.7.3 Consultation and Engagement Considerations

Although no concerns were raised by the public regarding ice throw or shadow flicker, the Study Team was made aware of the presence of cabins and cabin areas that need to be considered in the ice throw and shadow flicker analysis. The results of this analysis are presented in the next section.

4.2.7.4 Project-Environment Interactions

Potential interactions with identified KIs of the Human Health and Quality of Life VC are summarized in Table 4.2.7-2. Wind turbine operation is the only interaction that may result in shadow flicker or ice throw.

Table 4.2.7-2 Potential Project Interactions with Human Health and Quality of Life.

Project Component and Activity Description	Key Indicators: Human Health and Quality of Life	
	Shadow Flicker	Ice Throw
Construction		
Site Preparation		
Roads		
Staging and Laydown		
Temporary Batch Plant		
Equipment and Materials Transport		

Project Component and Activity Description	Key Indicators: Human Health and Quality of Life	
	Shadow Flicker	Ice Throw
Wind Turbine Foundations		
Electrical Infrastructure		
Wind Turbine Installation		
Hydrogen Generation Plant		
Hydrogenation Plant		
Toluene and MCH Storage and Transfer		
Flare Stacks		
Administration Buildings		
Temporary Workforce Accommodations		
Employment and Expenditures		
Operation and Maintenance		
Wind Turbine Operation	X	X
Wind Turbine Maintenance		
Electrical Infrastructure		
Venting and Flaring		
Road Maintenance		
Hydrogen Generation Plant		
Hydrogenation Plant		
Toluene and MCH Storage and Transfer		
Administration Buildings		
Employment and Expenditures		
Decommissioning and Rehabilitation		
Electrical Infrastructure		
Wind Turbine		
Administration Buildings		
Hydrogen Generation Plant		
Hydrogenation Plant		
Toluene and MCH Storage and Transfer		
Administrative Buildings		
Terrain Reclamation		
Temporary Workforce Accommodations		
Employment and Expenditures		
Accidents and Malfunctions		
Spills and Releases		
Flaring or Venting Incident		
Fire or Explosion		
Traffic Incidents		
Wind Turbine Collapse		
Ice Throw		

Project Component and Activity Description	Key Indicators: Human Health and Quality of Life	
	Shadow Flicker	Ice Throw
Water Supply Failure		
Wildlife Incident		
Occupational Hazard and Human Injury		
Notes X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected		

Shadow Flicker

A shadow flicker analysis was completed by Nortek Resource Solutions Inc. in April 2025 (Appendix K), to establish the maximum shadow distance for the proposed wind turbines. The analysis developed both theoretical and realistic scenarios to understand the extent of shadow flicker that may be caused by the wind turbines.

According to the Nortek report, there are no federal or provincial regulations defining criteria or maximum limits for shadow flicker from wind projects. However, in NL, a generally accepted guideline suggests that developers must demonstrate that receptors will receive no more than 30 minutes of shadow flicker per day and/or no more than 30 hours of shadow flicker per year.

A theoretical case was modelled under highly unlikely conditions, including but not limited to, the sun shining fully 100% of the time when it is above the horizon and the wind turbine rotor being always perpendicular to the sun. Under these conditions, the maximum shadow distance was calculated to be 2,044 metres.

In contrast, a realistic case was modelled based on site-specific monthly sunshine probabilities, providing a more accurate approximation of real-world conditions. A total of 96 receptors were identified and modelled in this analysis (see Figure 4.2.7-1). These receptors were located through public consultation and satellite/aerial imagery to identify buildings considered as dwellings. Additionally, two pseudo-receptors (areas of interest without buildings [AE and BX]) were modelled based on public comments. According to the theoretical case models, four of these receptors (M, N, AE and BX) would experience shadow flicker. As receptors AE and BX are pseudo receptors, the only shadow impact on existing dwellings is expected at receptors M and N located on the north side of Deer Harbour. However, shadow flicker for these two receptors would not exceed 30 hours per year or 30 minutes per day in accordance with NL Regulation 18/24 (Newfoundland and Labrador Regulation 18/24, 2024). Although the realistic case scenario cannot specify the exact number of minutes of shadow flicker per year, it is expected that receptors will receive no more than five hours of shadow flicker per year.

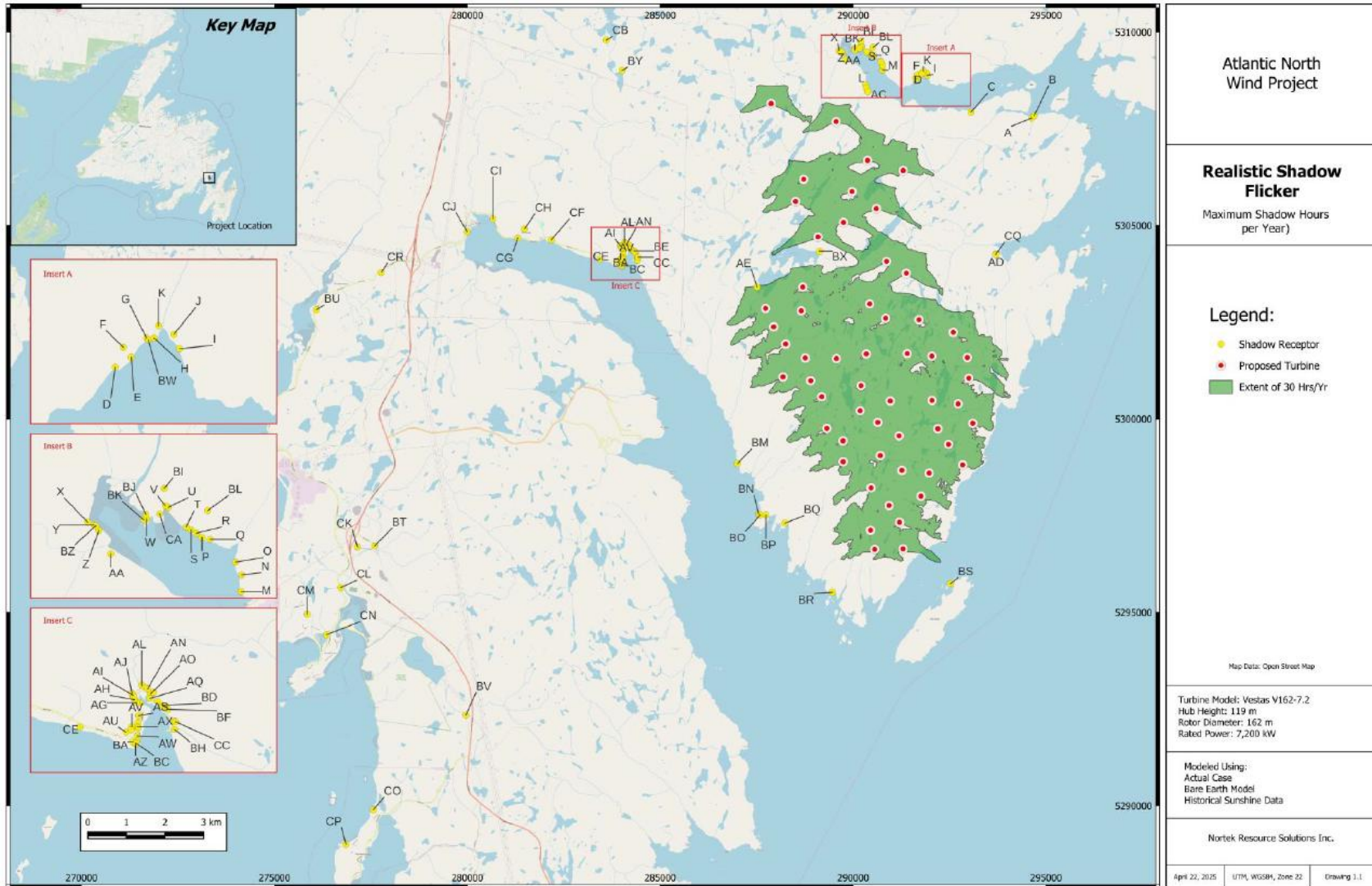


Figure 4.2.7-1 Shadow Flicker per Year Based on the Realistic Scenario for the Proposed North Atlantic Wind Farm (figure sourced from Nortek Resource Solutions Inc. Shadow Flicker Report (2025)).

Ice Throw

An Ice Throw Hazard Analysis (Appendix L) was conducted to assess ice throw and ice fall hazards to people, animals, and property within the maximum ice throw or ice fall zones.

Icing refers to any type of accumulation of ice or snow on a structure and occurs when water present in the air freezes after encountering a surface. Icing events are either meteorological or instrumental. Meteorological icing happens due to weather conditions. Instrumental ice, which is present and visible on a surface, can melt, sublimate, and shed (i.e., be thrown by a rotating blade) for days after meteorological icing. According to the Ice Throw Hazard Analysis, meteorological icing occurs 0.5 to 3% of the year (average of 1.8 to 11.0 days per year) and instrumental icing occurs 1 to 9% of the year (average of 3.7 to 32.9 days per year).

The Ice Throw Hazard Analysis was completed using the 55 wind turbine locations (see Appendix L), wind data provided by North Atlantic, and assuming the Vestas V162 6.8 wind turbine model (hub height of 119 m and rotor diameter of 162 m). The maximum ice throw distance for the planned wind turbines is 421.5 m.

The maximum ice fall distance, when the wind turbines are paused, depends on both the wind turbine characteristics (hub height and rotor diameter) and wind speeds. Table 4.2.7-3 includes the ice fall distance for various wind speeds while the wind turbines are paused. The likelihood of ice falling a distance greater than 333 m (the maximum ice fall distance) when the wind turbines are paused is considered extremely low to nil, as the likelihood of an ice fragment detaching at the same time as a gust of wind greater than 25 m/s is extremely low.

Table 4.2.7-3 Maximum Ice Fall Distance by Wind Speed.

Wind speed (m/s)	Maximum ice fall distance (m)
0	0
5	67
10	133
15	200
20	267
25	333

Ice throw and ice fall interactions may occur at various locations within the Wind Farm Area. A detailed list of receptors can be found in Appendix L. After decommissioning, ice throw and ice fall will cease, and conditions are expected to revert to their pre-Project state. This analysis does not consider the ice throw mitigation measures that will be implemented.

4.3 Accidents and Malfunctions

An accident is defined as an unplanned event, whereas a malfunction is defined as a failure to operate in the correct or intended manner. Accidents and malfunctions are unplanned events that may occur during all phases of the Project, with the risk of causing adverse environmental effects. An effective environmental management system reduces the probability of an accident or malfunction from occurring and limits the potential magnitude of any failure. North Atlantic has prepared an ERP to document the steps to be undertaken in prevention, preparedness and response to accidents and malfunctions. The ERP is provided in Appendix M. The following discussion identifies potential accidents and malfunctions associated with the Project, their potential effects and the measures that will be applied to reduce risk.

4.3.1 Emergency Preparedness

The North Atlantic ERP (Appendix M) for wind turbine and hydrogen / LOHC production operations details processes and guidelines for emergency response at both the Come By Chance and Sunnyside Facilities. The objectives of the ERP are:

- To preserve the health and safety of employees, contractors, response personnel and the public;
- To reduce adverse environmental effects;
- To reduce the risk of damage to property;
- To ensure that emergency response personnel are aware of the risks associated with the facility and its operations;
- To guide response personnel in deciding which measure to take in implementing them safely, quickly and efficiently;
- To minimize the amount of time and money required to resume normal operations;
- To inform citizens who may be affected by the event; and
- To communicate with the responsible authorities in the context of public safety.

A variety of Canadian codes and regulations will be adhered to regarding safe production and storage of hydrogen. These include, but may not be limited to:

- ASME (American Society of Mechanical Engineers) B31.3 Process Piping;
- ASME B31.12 Hydrogen Piping and Pipelines;
- ASME STPPT- 006 Design Guidelines for Hydrogen Piping and Pipelines;

- Hydrogen Technologies Code; and
- NFPA 55 Compressed Gases and Cryogenic Fluids Code.

Along with strict adherence to safety codes, the Project design has incorporated additional safety measures such as installation of stop valves, provision of continuous venting emissions monitoring, and a flaring facility.

In addition to risks associated with production, storage and transfer of hydrogen, toluene, and MCH, accidents and malfunctions associated with general industrial work may occur, such as spills and releases, fires, vehicle incidents, occupational hazards, equipment malfunctions, and human injuries. While preventative measures will reduce the likelihood of these accidents and malfunctions from occurring, the Project will maintain a comprehensive emergency response capability, including trained personnel, an inventory of response materials and full time access to medical care at the Braya Health Centre. Firefighting equipment, first aid kits, spill response materials, confined space rescue equipment, and high angle rescue equipment will all be readily available and maintained throughout the lifespan of the Project.

The ERP is considered a living document and will be updated to reflect changes to emergency response best practices and potential future revisions to Project design. The ERP will be made available to all North Atlantic personnel and Project visitors, if requested. Should the ERP be revised, the updated ERP will be circulated to all relevant and interested parties.

4.3.2 Incident Scenarios

Potential accidents and malfunctions identified are presented in Table 4.3.2-1, below. It is anticipated that the likelihood of a major accident or malfunction occurring is low, given proposed risk mitigation and management activities. Risk mitigation and management is an ongoing process, which allows for regular success assessments and refinement of practices. While the below accidents and malfunctions are considered to have the highest risk of occurring, additional scenarios beyond those presented may occur.

Table 4.3.2-1 Summary of Potential Accidents and Malfunctions.

Accident or Malfunction	Description of Scenario	Potential Adverse Effects
Accidental spills and releases of hydrogen, toluene, MCH and other hazardous materials	Hydrogen and/or toluene could be released during any phase following the introduction of chemicals to the Project in the Construction Phase. Release scenarios may arise due to ruptures, damage, or leaks to storage, transportation, or processing infrastructure. Risks associated with hydrogen and toluene will be	Hydrogen and toluene are both flammable, and a release of either introduces an increased risk of fire or explosion. Toluene is additionally toxic if inhaled in high enough concentrations. Depending on the volume, location, and material release, a

Accident or Malfunction	Description of Scenario	Potential Adverse Effects
	<p>contained to the electrolysis plant facilities, in Come By Chance.</p> <p>Hazardous material spills and releases can occur at any point during the Project lifespan and are most commonly associated with the use of hydrocarbons (equipment maintenance, refuelling, heavy equipment operation). Releases of other hazardous materials may be associated with mishandling and improper storage procedures.</p>	<p>hazardous material release may contaminate terrestrial and aquatic environments, resulting in the potential consumption and intake of contaminants by wildlife. Common risks to human health resultant of spills include effects to respiratory health, and skin and eye damage.</p>
<p>Flaring/venting of hydrogen and other gases</p>	<p>Disposal of waste gasses and relief of pressurized systems through safe release flaring and venting will occur through the O&M Phase of the Project. Hydrogen will be vented in the event of an emergency and/or for maintenance.</p>	<p>Venting of pressurized gasses may result in the dispersion of odours, and potential reduction of local air quality.</p>
<p>Traffic incidents</p>	<p>Traffic incidents may occur during all Project phases which utilize vehicles and heavy equipment, with potential for injury to personnel, wildlife, and damage to infrastructure.</p>	<p>Traffic incident consequences are variable depending on vehicle and road conditions. High consequence results of a vehicle incident would include human and wildlife injury, and the introduction of hazardous material to the surrounding environment.</p>
<p>Fires and explosions (other than from hydrogen)</p>	<p>Fires and explosions may occur during all Project phases. Accidental ignition events may result from chemical mismanagement, vehicle and heavy equipment malfunctions, and the flaring or venting of gasses.</p>	<p>Accidental ignitions may threaten human and wildlife injuries or fatalities, and in the event a fire is not contained, may spread beyond the bounds of the PA.</p>
<p>Dislodging of a wind tower or wind turbine blade</p>	<p>Wind turbine failure may occur during all Project phases following initiation of wind turbine construction. The likelihood of incident is highest during Construction and Decommissioning and Rehabilitation Phases due to the introduction of hazards associated with heavy equipment usage.</p>	<p>The failure or dislodgement of wind turbine components could harm personnel, wildlife, and infrastructure within the hazard setback buffer.</p>
<p>Ice throw</p>	<p>Ice throw and ice fall may occur at the Project during any phase following the construction of wind turbines, given that environmental conditions for ice accumulations are met. Wind turbine blades and other components may be subject to meteorological conditions that result in, the accumulation of ice mass that can increase vibrations from blade imbalance, and alter blade aerodynamic properties resulting in reduced power conversion efficiency. Accumulated ice can break or melt off the blades and structure, resulting in ice throw or ice fall.</p>	<p>People, animals and property could be damaged from ice throw within the hazard zone. While the hazard potential includes serious injury and fatality, this has not been documented at any wind farms.</p>

Accident or Malfunction	Description of Scenario	Potential Adverse Effects
Occupational hazards and human injuries	A variety of skills and work tasks are associated with the Project. Consequently, an array of occupational hazards will be present to personnel throughout all Project phases. A focus of project management will be on accident avoidance and prevention.	Workplace injuries can range from minor to severe and result in incapacitation over a range of timeframes.
Failure of industrial water supply	Failure of industrial water supply to meet processing quality resulting in the shut-down of the electrolyzers until the issue can be rectified. Mechanisms of water supply failure may include unavailability of water due to a spill, algal bloom, or water quality degradation (e.g., altered pH).	Adverse effects of an industrial water supply failure would likely be limited to the temporary shutdown of Project operations, with limited effects on the surrounding environment or personnel.
Wildlife emergencies/incidents	Wildlife interactions may increase throughout the lifespan of the Project as local wildlife become increasingly acclimatized to the Project presence. The Project is located within the habitat of a variety of animals, including several large mammal species.	Interactions between wildlife and Project personnel may lead to injury or death in extreme cases. Other effects include introduction of disease, and damage to Project infrastructure.

4.3.3 Risk and Risk Management

North Atlantic completed a Hazard Identification (HAZID) workshop in early 2025 to identify potential risks related to Project design. A Project hazard review was conducted for each failure scenario, which identified mitigation measures to reduce the associated risks.

The HAZID allowed for the identification and evaluation of both potential risks and mitigation measures prior to Project commencement. During the HAZID workshop, attendees examined proposed process systems, operational facilities, plan layouts, building locations, logistic hazards, and process equipment through the lens of structured risk criteria and subsequent risk ranking. The HAZID identification process allows for ensured regulatory compliance, and safety throughout the life of the Project. Results of the HAZID can be found in the HAZID Study Report (Appendix V1 and V2).

The following sections summarize the risk profile of the identified failure scenarios and presents a discussion of risk reduction measures.

4.3.3.1 Accidental Spills and Releases of Hydrogen or Toluene, and Other Hazardous Materials

Hydrogen has an elevated risk of ignition and combustibility compared to other fuels due to its flammability and minimal energy required to ignite. Therefore, it was assumed that in the event of a hydrogen release, a hydrogen fire will result. Hydrogen flames burn a pale blue which is difficult to detect by the unassisted eye during the daytime. Although hydrogen fires do not produce smoke themselves, burning of nearby combustible materials can result in smoke. Human health hazards related to hydrogen

inhalation and contact may include dizziness or asphyxiation, respiratory system irritation, burns, and/or frostbite.

As with hydrogen, toluene and MCH are highly flammable. Toluene may be considered toxic if inhaled, ingested, or contacted with bare skin (Canadian Centre for Occupational Health and Safety [CCOHS], 2023). Health hazards related to vaporous toluene may include dizziness, headaches, anesthesia, and respiratory arrest. As a liquid, toluene can irritate eyes and cause drying of skin. If ingested, liquid toluene may cause coughing, gagging, distress, and increased risk of pulmonary edema. MCH has similar health hazards, with vapours being irritating to the eyes, mucous membrane, upper respiratory tract, and skin. MCH may have narcotic effects and can cause dermatitis.

Incidental spills and releases of hazardous material have varying effects, depending on the material released, the quantity, and the location of the release. For instance, diesel fuel and gasoline are toxic to aquatic life. A spill of either material proximal to a sensitive receiving environment could cause damage to fish communities and habitat. Personnel exposed to hydrocarbon releases may experience headaches, shortness of breath, dizziness, lung irritation, and a variety of other symptoms (D'Andrea & Reddy, 2014). In the absence of appropriate personal protective equipment (PPE), a release of cleaning agents could cause adverse effects to personnel's respiratory systems, cause skin or eye irritation, and corrode clothing.

Risk Reduction

The ERP details emergency shut-down procedures in the event of a hydrogen, toluene, or MCH fire. This includes measures to protect personnel, infrastructure, and the local environment. The Emergency Response Team (ERT) will be trained to respond to both material fires and chemical fires.

Flammable chemicals will be stored at a safe distance from any sources of heat or potential ignition. This will include rendering the areas adjacent to hydrogen, toluene, and MCH storage as smoking-free areas. Ultraviolet (UV), or infrared (IR) flame detectors will be installed along hydrogen transfer areas to assist with identifying potential chemical fires. Additionally, North Atlantic will install auto-isolating valves on any MCH and toluene storage tanks, so as to reduce the likelihood of a release occurring. Liquid toluene and MCH storage infrastructure will be designed to direct release drainage to a retention facility to prevent uncontrolled pooling and potential pool fires, allowing for further release response measures to be conducted in a controlled environment. Due to the proximity of the road network to the electrolysis plant facilities, the pressurized hydrogen equipment will have vehicle impact protection implemented to mitigate the risks of collisions. Hydrogen transfer pipelines located beneath roads will be manufactured with materials which can withstand the weight of vehicles, and hydrogen gas detection will be implemented in areas of under-road pipeline crossings, to detect the presence of hydrogen leaks or cracks in the pipeline prior to risk of ignition. To allow for regular inspection of pipeline conditions,

underground pipelines will be placed in a culvert at intersections with roadways. During the MCH dehydrogenation process, a closed drain system will be installed for any hazardous or volatile materials, and any pumps which process hazardous or volatile materials will be equipped with double mechanical seals or tandem seals with barrier fluid systems.

Both input toluene and output MCH will be stored on the NARL Logistics Terminal. As a method of reducing the quantity of hazardous materials present at the Project, MCH product will be shipped monthly. Volumes of all stored hazardous materials will be minimized to the extent possible to lessen the likelihood and consequences of a hazardous release.

In the event of a liquid MCH/toluene spill, non-flammable absorbent material will be available on-site. This may include dry sand, earth, or vermiculite. Contaminated absorbent material will then be stored in chemical waste containers for further disposal.

All Project infrastructure related to hydrogen, toluene, and MCH will be inspected on a routine basis by plant personnel.

Storage and handling of hazardous materials will be based on best practices outlined in the applicable Material Safety Data Sheets (MSDS). The MSDS of all hazardous materials present on site will be readily available at the Project for personnel review as needed. Emergency washing facilities will be installed in working areas of the Project where risk of eye or skin exposure to harmful or corrosive material or other material that may burn or irritate is possible. Personnel who handle hazardous material will be provided with hazard-specific PPE, such as chemical-resistant gloves or respirators.

Preventative spill and release measures will be introduced to reduce the potential for a consequential hazardous material spill. These measures may include, but are not limited to:

- Mandatory health and safety orientation for all Project personnel and visitors prior to commencing work. Where applicable, training will be provided to personnel on storage and handling of task-specific hazardous materials.
- Designating areas of site maintenance, vehicle maintenance, and vehicle refuelling which are 30 m or more from sensitive environments (i.e., wetlands and watercourses).
- Ensuring spill response materials are readily available and regularly stocked in 'spill kits' placed strategically throughout the PA. Spill kits may include absorbent pads, spill booms and bagged sand.
- Assigning designated storage areas for hazardous materials, with materials being stored in secondary containment where applicable.

- Enforcing a robust spill reporting and clean up protocol, which will include details regarding contaminated material disposal.

The ERP includes details on responding to spills and releases of varying volumes. Spills or releases to air, land, or water are addressed further in the ERP. While all employees will be trained on basic spill response procedures, an ERT will be trained in depth on responding to large spills which have potential to impair human, animal, and environmental health.

The installation of UV and IR flame detectors, coupled with auto-isolating valves on MCH and toluene tanks, will reduce the likelihood of a release to low probability. While the likelihood of a release will be reduced with the implementation of the above measures, the severity of consequence remains high.

The application of preventative and mitigation measures for the array of other hazardous materials as described in the ERP, provides assurance that both the likelihood of occurrence and subsequent consequences of a potential spill or release will be low.

4.3.3.2 Flaring/Venting of Hydrogen and other Gasses

Flaring and venting act as mitigation measures to avoid or reduce the consequences of other unplanned fire or explosive events. Therefore, the likelihood of flaring or venting occurring is directly tied to the probability of an unplanned event.

The risks associated with flaring and venting are variable depending on the material being dispensed. At low gaseous concentrations, there may be a resultant odour and a short-term reduction in air quality. Should the flare mechanism fail, there is potential for typically flared off gasses to be released as a toxic, flammable gas cloud. In the unplanned event of a toluene, MCH, or hydrogen vapour release, ignition of vapours could result in a vapour cloud explosion.

The composition of flared off-gasses is predicted to be composed of predominantly methane, MCH, and hydrogen, with lesser amounts of n-hexane, methyl cyclopentane, n-heptane, dimethyl cyclopentane, methyl cyclohexane, ethyl cyclopentane, and dimethyl cyclohexane. Venting of hydrogen and oxygen will occur at the HGP.

Risk Reduction

An ambient air quality station will be installed at the Project to continuously evaluate and monitor the air quality local to the Project. An AQM program will be implemented in conformance with the requirements of the NL DECC.

Venting outputs will be routed to safe locations, away from high personnel traffic areas, to allow for rapid dispersion and dilution.

Flare units will be equipped to manage unplanned events such as power outages and system failures. For flaring and venting to remain controlled, flare units will continuously measure emission volumes and concentrations. Flare locations will be selected at a safe distance from venting to avoid the possibility of high wind directing flare to vented gaseous releases. Both flaring and venting units will undergo routine inspections and maintenance.

The ERT and environmental coordinator will be notified of all flaring and venting activity, to allow for increased hazard monitoring, supplementing the flare unit emissions measurements. Should there be an uncontrolled release, neighbouring facilities and businesses will be alerted.

Since flaring and venting are associated with unplanned events, their likelihood of occurrence has conservatively been assessed as moderate. The consequence severity has been assessed as low, given the implementation of the above mitigation measures.

4.3.3.3 Traffic Incidents

The likelihood of a traffic accident occurring is directly related to the volume and speed of vehicles operating at the Project. While vehicles will be used during all phases of the Project, traffic is anticipated to be increased during the Construction and Decommissioning and Rehabilitation Phases. The public will be permitted to utilize new Wind Farm access roads, except for brief periods during all phases of the Project when there is an elevated risk to health and safety. These periods of public access restriction will be most common during the Construction Phase. Regarding terminal facility access, the access road to the facility is public, while the HGP and HP will be located within the limits of the NARL Logistics Terminal and Braya security area and will therefore have limited public access.

Activities which will require vehicle use include passenger vehicles transporting personnel and materials throughout the PA, heavy equipment movement, and transportation between the PA, various local ports, and substations.

Conditions which may additionally influence the likelihood of a traffic accident occurring include:

- Changing road conditions due to environmental factors (i.e., reduced visibility due to heavy precipitation or dust, ice coverage).
- Changing road conditions due to structural factors (i.e., frequency of road maintenance activities, loose gravel, potholes).
- Operator error (i.e., fatigue, new driver, inattention due to distractions).

- Mechanical failure (i.e., vehicle breakdown).

The consequences of a vehicle traffic accident may be amplified with increased speeds.

Risk Reduction

A Traffic Management Plan will be developed to ensure both reduced disruption to local commuters on public roads, and to reduce the likelihood of a traffic incident occurring. The below incident mitigation measures will be detailed further in the Traffic Management Plan:

North Atlantic will maintain reduced speed limits within the PA, with speed limits variable depending on terrain and infrastructure.

In areas of increased risk or reduced visibility, access will be restricted to personnel with permitted access.

A staffed office will be constructed at the intersection of the Wind Farm access road, with the access road being publicly accessible through the majority of the Project lifespan. During periods of increased risk (i.e., during windfarm construction), the access road may be closed to the public.

Structural roadway designs will enhance mitigation measures, with road widths accommodating multiple vehicle types depending on road usage, reduced road slope grades where possible. Following the construction of wind turbines, safety berms may be constructed in areas where there are increased risk vehicles leaving the roadway.

Vehicle Inspection Sheets will be completed by personnel prior to operating any Project vehicle to identify any maintenance or safety issues

Project vehicles will be maintained regularly and equipped to manage seasonal changes.

Transportation of large wind turbine components will be conducted in accordance with the NL **Highway Traffic Act**, which may include applying for an Overweight and Over Dimensional Special Permit. Transportation may be conducted during reduced traffic hours (i.e., overnight).

Project personnel who are involved in vehicular incidents and found to be at fault or in error will attend a Defensive Driving Course, and may not be permitted to operate a vehicle for a period of time.

Operations of all vehicles at the Project will align with the NL **Highway Traffic Act**.

The likelihood of a traffic accident occurring is variable depending on the volume and speed of vehicles operating at the Project. By implementing a stringent Traffic Management Plan and enforcing speed limits throughout the PA, the severity of a traffic incident at the PA can be reduced to having low consequences.

4.3.3.4 Fires and Explosions

A hydrogen release or toluene/MCH release would pose the highest potential for fire or explosion risk at the Project, and is discussed in Section 4.3.3.1, above. This section refers to accidental fires and explosions which are not resultant of a potential hydrogen, toluene, or MCH release. Accidental fires and explosions may also occur as a result of Project activities, during all phases of the Project.

Sources of fire due to Project activities may include hot work, dry conditions, improper cigarette disposal, overheated equipment and vehicles, and failure of fuel storage facilities. Fires originating from fuel storage facilities pose the greatest risk of explosion. Electrical fires may also ignite within the confines of wind turbines.

Risks associated with fires and explosions include effects on human and animal health and safety, destruction of vegetation and habitat, reduction of air quality, and/or damage to infrastructure. Should a fire not be contained, there is a risk of damage extending beyond the PA.

Risk Reduction

Project infrastructure will be constructed in alignment with the Newfoundland **Fire Protection Services Act** and the *National Fire Code of Canada* (Canadian Commission on Building and Fire Codes, 2020). The ERP will detail fire prevention, mitigation, and response measures. These measures may include, but are not limited to:

- Fire forecast risk monitoring;
- Posted disposal measures in highly visible areas for flammable materials, including cigarettes.
- Designated smoking areas;
- Installation of fire detection and protection systems in high-risk areas, such as fuel and hazardous material storage, and hydrogen transfer pipelines;
- Ongoing storage and maintenance of fire response equipment on site, including heavy equipment (e.g., fire trucks), fire extinguishers, and PPE;
- Site orientation to include fire prevention measures, and personnel roles and responsibilities during fire events; and
- Ongoing training of the ERT to ensure fire response capabilities are up to date.

A Jetty Regulations and Information booklet will be provided to the captains of all vessels upon arrival, which will include information related to fire prevention and response. Vessel captains will be required to sign for receipt and agreement with the information provided in the booklet.

All technicians working on wind turbines will carry an automated external defibrillator and self-rescue gear, including a safety harness and self-rescue rappelling device. All nacelles will be equipped with fire extinguishers and external ladders. Should nacelle exits be inaccessible due to fire presence, the safety harness and rappelling device will be used to rappel from the roof of the nacelle. Response to wind turbine fires is discussed further in the ERP.

The likelihood of a fire or explosion occurring is considered moderate due to the variety of potential ignition sources throughout the Project Construction and O&M Phases. With the implementation of thorough emergency preparedness and response procedures, the severity of a fire or explosion at the PA can be reduced to having low consequences.

4.3.3.5 Dislodging of a Wind Tower or Turbine Blade

The primary failure mechanisms of wind turbines can be broadly classified into mechanical, electrical, and environmental causes. Mechanical failures may include fatigue, erosion, and material defects to wind turbine components such as rotor blades, bearings, the gearbox, and the main shaft. Wind turbine electrical components include generators, converters, and control systems, all of which may experience failures resultant of insulation degradation, thermal stresses, and electrical transients. Environmental factors such as severe weather events, lightening strikes, extreme temperatures, humidity and corrosion may additionally contribute to potential wind turbine failure (Thomas, 2024).

Mechanical failures may lead to blade detachment and structural collapse. Continuous mechanical stress to wind turbine components may weaken critical connection points.

The potential for dislodgement of a wind turbine tower or blade is highest during the Construction and Decommissioning and Rehabilitation Phases, due to the introduction of hazards associated with using tower cranes and other heavy lifting equipment.

Risk Reduction

Prior to the Construction Phase commencing, meteorological towers were installed at the Project to collect baseline data regarding wind speed and direction, temperatures, and atmospheric pressure. The baseline weather data was coupled with baseline geotechnical surveys which identified areas of suitable wind turbine base installation. Suitable wind turbine base location was based on avoiding areas of increased erosion potential and slope instability.

Wind turbines were micro-sited based on hazard setback distances. Setback distances were determined based on the potential throw distance of wind turbine components in the unlikely event of dislodgement or collapse. Project personnel will be cautioned to reduce the amount of time spent within the hazard setback distance.

Routine inspections of wind turbine components allow for early identification of fatigue and erosion. Scheduled preventative maintenance, including the replacement of high-stress components, will be conducted on a regular basis. Detailed records of maintenance inspections and activities will be retained at the O&M Building.

Weather forecasts will be monitored on a regular basis, to determine if wind turbine operations should be reduced due to severe storm events. As a supplement to weather forecasts, wind levels will be monitored by use of the existing meteorological stations.

Should a wind turbine or wind turbine component experience a dislodgement or structural collapse, the wind turbine will be isolated and de-energized. Access to the damaged wind turbine will be restricted to exclusively authorized personnel. All appropriate stakeholders and local authorities will be notified of the incident. Depending on the severity of the incident, following wind turbine isolation and access restriction, repair or removal measures will commence. Given the significant size and weight of wind turbine components, repairs and removals will likely need to be conducted with the assistance of cranes.

Based on the low degree of wind tower and/or blade dislodgements occurring in the industry, the probability of a failure scenario occurring is considered low. The severity of the consequences to health and safety would be confined to the hazard setback distance around the wind turbine and is therefore also assessed as low.

4.3.3.6 Ice Throw

Ice throw is the phenomenon by which accumulated ice on wind turbine blades is projected from the wind turbine during operations. If ice detaches from the wind turbine while the blades are immobile, it is instead referred to as ice fall. Ice accretion is reliant on two principal factors occurring: air temperatures between the range of 3°C and -20°C, and the wind turbine being situated within a cloud or precipitation event (Canadian Renewable Energy Association (CanREA), 2020).

Ice fall is not limited to stationary wind turbines; any iced structure on the Wind Farm can also be a source of falling ice.

The highest severity hazards associated with ice throw and fall include:

- Serious injury or fatality to unprotected personnel within the vicinity of the ice throw zone during periods of rotor icing;
- Serious injury or fatality to wildlife within the vicinity of the ice throw zone during periods of rotor icing;
- Damage to property and infrastructure within the ice throw zone during periods of rotor icing, including damage to vehicles, equipment, electrical or other infrastructure, and buildings; and
- During icing periods, wind turbine operations will be paused, therefore disrupting the supply of electricity to the HGP. The formation of ice throw and assessment of potential throw distance is discussed further in the Ice Throw Hazard Analysis (Appendix L).

Risk Reduction

The risk of injury or fatality due to ice throw strikes will be reduced by application of the following mitigation measures:

- Issuance of ice watch notifications when ice fall conditions are present, notifying personnel to avoid areas where ice fall is a risk;
- Shutdown of wind turbines during rotor icing periods;
- Installation of ice protection devices, such as covered entrances to wind turbine base access points thereby enabling personnel to step from the protection of their vehicle directly to the protection of covered entrances; and
- Utilization of anti and de-icing technologies, such as heaters for wind turbine blades.

While the potential effect of ice throw on persons is at the highest consequence rating (serious injury or fatality), in the history of wind farm operations in cold climates, there has never been a single recorded incident of injury or fatality from a strike of falling or thrown ice. While the likelihood of occurrence is very low at the outer areas of the maximum ice throw zone, the area directly under a wind turbine, or any iced structure should be considered as medium (CanREA, 2020).

Given the climate in which the Project is located, the likelihood of ice throw occurring through the O&M Phase is moderate. Through implementation of CanREA guidance, coupled with the results of the Ice Throw Hazard Analysis (Appendix L), the consequence severity can be reduced from moderate to low.

4.3.3.7 Occupational Hazards and Human Injuries

Workers may be exposed to occupational hazards and injuries during all phases of the Project. In the NL construction industry, the highest reported injuries resulting in lost-time between 2017 and 2021 were sprains, strains, tears, fractures, back pain, and cuts and lacerations (WorkplaceNL, 2022).

Risk Reduction

All Project activities will be conducted in alignment with the duties of employers and employees outlined in the NL **Occupational Health and Safety Act**. Generally, this includes but is not limited to:

- Establishing an Occupational Health and Safety (OHS) program, which will be posted in a prominent location at the Project;
- Ensuring the workplace, necessary equipment, systems, and tools, are safe and do not risk the health of employees;
- Providing necessary training, instruction, and supervision;
- Ensuring that all employees are familiar with potential workplace health and safety hazards; and
- Employees taking reasonable care to protect their own health and safety, as well as the health and safety of those around them.

North Atlantic will implement additional measures, including:

- Mandatory health and safety orientation for all Project personnel and visitors prior to commencing work;
- Mandatory task-based PPE;
- Daily health and safety meetings (referred to as ‘Tailgates’) to identify potential health and safety risks; and
- Signage of safety and hazard awareness in high-traffic and high-risk areas.

During medical events, North Atlantic will have 24/7 access to the Braya Health Centre which is staffed during the day Monday through Friday with an industrial nurse. Should medical care be required during evenings and weekends, the Braya Medical Centre is further staffed by technicians with advanced first aid training.

Injuries may range from minor to severe (requiring medical intervention and time off work). With the implementation of the ERP and an OHS program, both the likelihood and severity of occupational hazards and injuries are anticipated to be low.

4.3.3.8 Failure of Industrial Water Supply

The electrolysis process of extracting hydrogen is reliant on the availability of freshwater. A failure or loss of the industrial water supply would result in the temporary shutdown of hydrogen production until the water supply can be restored. During shutdown, the source of the failure will be identified and corrected. The Project will not return to full operation until the failure has been rectified.

Should the water failure be resultant of a leak or infrastructure damage, there is potential that the failure would also have affected hydrogen conveyance infrastructure, therefore introducing the possibility for a simultaneous hydrogen release.

Failure of water management infrastructure, such as pipeline leaks, and culvert failure, may result in the loss of process water supply or an unplanned release to the surrounding environment. As above, depending on the volume of process water supply released, a temporary shutdown of hydrogen production would occur. As with an accidental spill, the consequence severity of an unplanned release of process water is dependent on the location and volume of the release. Should a high volume of water be released, localized flooding may occur, presenting a risk of infrastructure damage, erosion, and electrocution should electrical equipment be nearby.

Risk Reduction

A reserve of emergency fire response water will be stored separately from the electrolysis processing facility, therefore maintaining emergency response capability regardless of incidents occurring to process water supply.

Water supply is based on the existing Inkster's Pond Industrial Water Supply Area (licensed under WUL-14-057 for Braya). To date, there have not been reductions in supply availability within this water licence. However, North Atlantic will apply for a new water use licence from the NL DECC. Water storage and transportation infrastructure will be inspected regularly to detect and avoid potential failures. Daily monitoring will confirm the available quantity of process water. The ERP details response protocol in the event of flooding, which includes evacuation measures and direction regarding the management of electrical equipment and hazardous materials proximal to the release. Releases to air, land, or water are addressed in the Environmental Emergency Plan.

While the consequence severity of an industrial water failure would be high with respect to Project operations, the effects to human health and the surrounding environment would be minimal. The likelihood of an industrial water failure is considered low given the availability of water supply.

4.3.3.9 Wildlife Emergencies/Incidents

While wild animals typically avoid interaction with humans, they can become tolerant over long-term exposure and more readily approach humans and infrastructure. At the highest severity, risks associated with wildlife encounters can include attacks, transfer of disease, and damage to infrastructure. With the implementation of preventative and cautionary measures, the likelihood of wildlife interactions can be minimized.

Risk Reduction

Attraction of wildlife to the Project will be reduced by storing all edible garbage and food waste either indoors, or in secure waste disposal bins. Signage will be posted throughout the Project indicating appropriate waste disposal actions. While some animals may become comfortable enough around humans to 'beg' for food, personnel will be strictly forbidden from both approaching and feeding wildlife. Should large or potentially dangerous wildlife enter the PA, deterrents such as air horns, bear spray, and flashing lights will be readily available to encourage the wildlife to vacate the area. Should evidence of animal activity be identified (i.e., tracks, scat, claw marks, burrowing), the environmental coordinator will be notified and escalate the observation to the ERT as needed. All wildlife sightings and interactions will be documented.

In the event of an animal encounter, responsive actions will prioritize personnel safety. All efforts will be made to reduce effects to wildlife during deterrent measures, once personnel safety has been established.

Following the implementation of the above mitigation and response measures, the likelihood of a hazardous interaction with wildlife is considered low, while the consequences could range from low to moderate depending on the species.

4.4 Effects of the Environment on the Project

This section describes the effects of the environment on the Project throughout the Project's lifespan. This will help distinguish the effects from natural processes and the environment. The main environmental considerations that will be discussed are as follows:

- Weather and Climate Change;
- Algal Bloom;
- Geographical Hazards; and
- Forest Fires.

4.4.1 Weather and Climate Change

Harsh weather conditions and climate change can pose risks to Project infrastructure and equipment. These conditions include extreme snowfall, freezing rain, storms, and hurricanes. The baseline description of weather and climate change is detailed in Section 3.1.1. Further, weather and climactic conditions (e.g. average and extreme temperatures and wind speeds) are inputs to the Basis of Design of the Pre-FEED engineering design studies (Hatch, 2024 and Hatch 2025). Each interaction will be considered for each phase of the Project. All equipment sourced for the Project will be designed to operate at baseline weather conditions. For example, the wind turbine being considered for the Project has an operating temperature range between -20°C and 45°C (with provision for a -30°C minimum operating temperature based on inclusion of a cold weather operating package).

4.4.1.1 Temperature

Daily average temperatures in the PA (represented by Dunville / Argentia), as outlined in Section 3.1.1, ranged from -2.3 to 16.4 degrees Celsius (°C), with the lowest average temperatures occurring in February and the highest in August (Government of Canada, 2024a). It is expected with climate change that temperature increases (2.2 °C to 5.3 °C) will occur in Dunville / Argentia over the next century. The predicted increase in temperature will cause precipitation to trend towards rain rather than snow with fewer days below freezing, particularly in the spring and fall.

Although temperature changes alone are not likely to have severe effects on the Project, extreme weather hazards caused by temperature changes could affect the Project during the O&M Phase. These weather events include storms, significant weather events, and seasonal fluctuation (e.g., rapid freeze and thaw conditions in winter). Hotter and drier conditions can lead to droughts and wildfires. Fluctuating temperatures in the winter months can cause road washouts, leading to temporary limited access to Project facilities. As a result of ocean temperatures rise globally, there will be an increase frequency of storm events (e.g., hurricanes) and potential longer and stronger periods of landfall. Storms are further discussed below in section 4.4.1.3.

4.4.1.2 Precipitation

With climate change, there are projected increases in precipitation event intensity along the south coast of Newfoundland; the PA may see changes in precipitation intensity in the winter, spring, and fall. Projected changes in maximum 3-day, 5-day, and 10-day precipitation, as well as the 90th percentile of precipitation events, follow regional patterns like those described for mean precipitation intensity. Hazardous events typically occur over several days, during which time reservoirs, soil moisture capacity, and waterbodies reach capacity, eventually resulting in overflow and potential flooding. Given the nature of the topography in the PA and the local siting of Wind Farm, any potential overflow from local ponds will have minimal effect on the Project.

Flooding, erosion, and road washouts can be caused by extreme precipitation events along with consequential surface water runoff. This in turn, can cause roads to become unusable, limiting access to Project infrastructure. Consequently, this can cause delays in transportation of important materials for components, including, materials and supplies, products to market, and the workforce to and from the Project.

The low flow period within the PA generally occurs in summer to early fall, as outlined in the Surface Water Study (Appendix C). The study confirmed sufficient water availability for the Project with considerations for seasonal variability.

4.4.1.3 Snowfall, Freezing Rain, and Storms

The Project design considered winter weather including snowfall, freezing rain, and storms. Due to climate change, it is predicted that there will be fewer but heavier snowstorms and more frequent and heavier occurrences of rain during the winter season.

Accumulation of snowfall may strain utility systems (transmission lines, electricity grid connection) and structures, creating the risk of structural issues or failures. The loss of electrical power would disrupt production.

Freezing rain may result in the accumulation of ice on surfaces, increasing the risk of damage to utility systems, equipment and infrastructure. Accumulation of ice on wind turbines increases the risk of ice throw. Ice may build up on wind turbines during inactive periods. When the turbines become active, the potential for ice throw emerges, where chunks of accumulated ice may be thrown from the rotating blades.

Storms may result in flooding, damage to structures, and compromise the integrity of equipment. Storms may cause shipping delays in the receipt of materials for construction (i.e., wind turbine components, plant components). The occurrence of extreme winds necessitates a safeguard mechanism for wind turbines. A protective protocol engages the rotor to stop moving when the 10-minute average wind speeds surpass 25 m/s. The design of the wind turbine foundations (gravity and rock-anchored) will take into consideration the likelihood of high winds. As mitigation for the risk of ice throw, all Project wind turbines will be outfitted with de-icing technology and icing protocols will be implemented throughout operations of the Project.

In addition, snowfall, freezing rain and storms may also impair road conditions, creating unsafe driving conditions for workers, resulting in Project delays or temporary disruption to production.

4.4.1.4 Sea Level and Ice

Rising sea levels associated with climate change have the potential to result in adverse effects. Coastal sea levels in Come By Chance and Sunnyside are projected to rise, as outlined in Section 3.1.2, by 40 cm by 2049 and up to 90 cm by 2099. These projections are shaped by minimal crustal rebound in the region, which provides little offset to rising sea levels. As a result, areas such as Come By Chance and Sunnyside have a heightened vulnerability to the effects of sea-level rise, including more frequent and severe flooding, increased coastal erosion, and greater risks to infrastructure and ecosystems. Changes in water depth may disrupt or alter shipping routes which are vital for transportation. Coastal areas are susceptible to erosion and submersion of low-lying areas. Areas of the PA situated along shorelines become more exposed to the forces of waves and storm surges. Consequently, the heightened exposure increases the likelihood of erosion and flooding, bringing additional risks to the Project.

Alternatively, a reduction in sea ice increases the opportunities for shipping, tourism, resource exploration, and industrial activities, that may benefit the Project.

4.4.1.5 Wind

The maximum hourly wind speeds in Placentia Bay were recorded at 99 to 108 km/hr during the spring, 90 to 99 km/hr during the summer, 108 to 117 km/hr during the fall and 90 to 99 km/hr during the winter. The prevailing wind direction was westerly in the fall and winter and southwesterly in the spring and summer, although winds occur from all directions throughout the year.

Extreme wind conditions may cause damage to the wind turbines depending on the cut-in and cut-off speed. Wind thresholds are established to protect the wind turbine blades and the wind turbines themselves. Therefore, increased sustained winds above 90 km/hr will lead to the increased precautionary temporary shut down of wind turbines. Further, the Canadian Building Code and the associated maximum wind speed, will be utilized as the design conditions for a wind turbine structural components. In addition, extreme wind conditions can also cause damage to infrastructure. As climate changes and storms increase in frequency and intensity, spanning a couple days or more, this may lead to reduced energy production and supply to the HGP.

4.4.2 Algal Bloom

The Project proposes to utilize the existing Inkster's Pond Industrial Water Supply Area (licensed under WUL-14-057 for Braya). This pond may be susceptible to algal blooms which could degrade water quality and require additional treatment for the operation of the HGP. In addition, algal blooms may clog intake systems or filtration equipment, potentially leading to operational interruptions.

Regular inspection and maintenance will occur associated with the water intake structure at Inkster's Pond so that algal blooms can be detected and managed accordingly. Therefore, it is anticipated that algal blooms are not expected to have an environmental effect on the Project.

4.4.3 Geological Hazards

A review of topographic, surficial and bedrock mapping, and publicly available information was undertaken to understand the possible geological hazards within the PA. Further information regarding the surficial and bedrock geology of the LAA is provided in Section 3.1.3.3.6.

4.4.3.1 Terrain Stability

Based on the review of satellite imagery, there is no indication of any type of large-scale landslides, rockfalls or slope instability within the PA. The coastline sections of the PA may experience energetic erosional events from storm surges; however these conditions have little to minimal effects on the Project due to the location of infrastructure. The PA is mainly covered by vegetation and wetlands, which also assists in adding to the stability of the coastal edges and interior areas.

4.4.3.2 Seismic Activity

Seismic hazard relates to the probability of damaging ground motions caused by earthquakes occurring in an area. The Natural Resources Canada Earthquake Database is an interactive tool that allows users to search and filter seismic activity records based on customizable criteria (NRCan, 2025). According to the search results of the Earthquake Database, there was a total of 37 earthquakes documented within a 250 km radius of Come By Chance from 1985 to 2023: 26 earthquakes of magnitude 2.0 or greater and 11 earthquakes of magnitude 3.0 or higher. Although no seismic events have been reported within the PA (NRCan, 2025), the nearest recorded activity occurred in 2024, approximately 50 km from the PA and 9 km from Bay Roberts, with a magnitude of 2.2. Earthquakes are considered rare in NL (NLJPS, n.d.).

Unlike regions along tectonic plate boundaries, such as British Columbia where the rate and size of seismic activity is directly correlated with plate interaction, eastern Canada is part of the stable interior of the North American Plate. In intraplate regions such as the island of Newfoundland, seismic activity appears to be related to the regional stress fields, with the earthquakes concentrated in regions of crustal weakness (Natural Resources Canada, 2021). The Geological Survey of Canada prepares seismic hazard maps based on statistical analysis of previous earthquakes and information about tectonic and geological structures. The seismic hazard risk for the island of Newfoundland is low according to 2015 and 2020 seismic hazard maps of Canada, implying that the probability of major damage to buildings (which occur with seismic magnitudes greater than 3) within the region is less than 1% in 50 years (NRCan, 2021).

Based on the available data and seismic history of the region, the likelihood of a seismic event occurring in the PA that could damage or interrupt Project operations is low. This assessment reflects both the region's minimal seismic activity risk and the implementation of the nationally recognized design standards. Project infrastructure will be designed and constructed to withstand potential seismic events and as recommended by the National Building Code of Canada (National Research Council of Canada, 2015).

4.4.4 Forest Fires

Forest fires may result in delays in schedule, damage to Project infrastructure and loss in production during the O&M Phase. Electrical infrastructure including substations, transmission lines, and collector lines are vulnerable to damage, potentially resulting in power outages. Forest fires may also obstruct access roads and damage water crossings. In addition, forest fires may create health and safety risks to Project personnel from reduced visibility due to smoke and poor air quality.

As indicated in Section 3.1.1.2, projected changes to the maximum number of consecutive dry days as a result of climate change are minimal overall, with the exception of a significant decrease observed in the spring. The maximum number of consecutive dry days is projected to decrease by 13 over the next century during the spring season. This suggests a notable shift toward wetter conditions lowering the risk of forest fires. Project infrastructure will be designed and operated to reduce risk of damage from wildfire. Areas such as transmission rights-of-way and wind turbine pads will be maintained to ensure vegetation is controlled.

4.5 Mitigations

Mitigation measures to address the potential effects of the Project on each VC are outlined in the following sections. Measures included in monitoring and management plans, which support adaptive management, are also proposed, as described in Section 4.6. Other measures include project design mitigation (described according to VC throughout Section 4.5), standard environmental protection procedures and best management practices which North Atlantic has committed to uphold (Section 12), and contingency measures to manage potential accidents and malfunctions that could affect the environment (Section 4.3).

4.5.1 Atmospheric Environment

Standard mitigation and enhancement measures applicable to the Atmospheric Environment VC are provided by phase in Table 4.5-1. Project-specific plans (e.g., the Explosives and Blasting Management Plan) will also include mitigation measures that are applicable to this VC.

The Project as designed has incorporated mitigation measures to minimize potential effects on the atmospheric environment. Briefly, design considerations according to each KI include:

- A conservative setback distance of greater than 1,000 m was selected for siting wind turbines (i.e., minimum required distances between a wind turbine and dwellings) to reduce noise effects on nearby residents;
- Avoidance of conflicts with other land uses or users; and
- Operational equipment is selected with low noise options, where applicable.

Table 4.5-1 Atmospheric environment mitigation and enhancement measures.

Project Phase	Key Indicator	Interaction	Mitigation
Construction, Decommissioning and Rehabilitation	Air Quality	Project activities may result in air emissions which could temporarily diminish air quality.	<ul style="list-style-type: none"> • Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Implement control measures such as road watering, application of approved chemical suppressants, or physical barriers, where appropriate, to reduce fugitive dust generation on exposed surfaces (e.g., unpaved roads, laydown areas, stockpiles), where applicable. • The blasting contractor will develop an Explosives and Blasting Management Plan, which will include design measures to reduce dust generation. • Implement and maintain speed limits and, where necessary, speed bumps to limit dust generation. • Idling will be limited to the extent practicable, and vehicles / equipment will be turned off when left for extended periods of time. • Stockpiles will be covered, where practicable, to reduce fugitive dust generation. • <u>Strategically locate stockpiles by considering prevailing wind directions and the proximity of sensitive receptors such as wetlands, waterbodies, rare plant habitat, and residential areas, ensuring environmental effects are minimized.</u>
O&M	Air Quality	Project activities may result in air emissions which could temporarily diminish air quality.	<ul style="list-style-type: none"> • Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Implement control measures such as road watering, application of approved chemical

Project Phase	Key Indicator	Interaction	Mitigation
			<p>suppressants, or physical barriers, where appropriate, to reduce fugitive dust generation on exposed surfaces (e.g., unpaved roads, laydown areas, stockpiles).</p> <ul style="list-style-type: none"> • Idling will be limited to the extent practicable, and vehicles / equipment will be turned off when left for extended periods of time. • Implement control measures such that emissions generated from flare stacks are reduced.
Construction, O&M, Decommissioning and Rehabilitation	GHGs	Project activities may increase atmospheric GHG levels.	<ul style="list-style-type: none"> • Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Vehicles and equipment are to be turned off when left stationary for extended periods. The idling of engines will be avoided and / or minimized, wherever practicable.
Construction, Decommissioning and Rehabilitation	Light	Project lighting may contribute to increased ambient lighting levels and/or nuisance of sensitive receptors.	<ul style="list-style-type: none"> • Limit artificial lighting to what is necessary to maintain safety of site workers. • Where reasonable and feasible, construction should be carried out during standard daytime working hours. • Should nighttime work be required, lighting to be limited to what is necessary for safety and efficiency. • Use downward-facing lighting directed towards Project infrastructure, as practicable, to minimize disturbance to wildlife activity.
O&M	Light	Project lighting may contribute to increase ambient lighting levels and/or nuisance of sensitive receptors.	<ul style="list-style-type: none"> • Limit artificial lighting to what is necessary to maintain safety of site workers. • Install downward-facing lights on buildings, wind turbine bases and access roads. Where possible and permitted, equip downward-facing lighting with motion and heat sensors. • Set wind turbine and meteorological tower lighting levels to the minimum allowed by Transport Canada for aeronautical safety. • Use white or red strobe lights with the minimum allowable intensity and flashes per minute as required by Transport Canada.
Construction, Decommissioning and Rehabilitation	Noise	Project activities may contribute to increased noise levels.	<ul style="list-style-type: none"> • Develop and implement a Construction Noise and Vibration Monitoring Plan. • The blasting contractor will develop an Explosives and Blasting Management Plan, which will include design measures to reduce shock or instantaneous peak noise levels.

Project Phase	Key Indicator	Interaction	Mitigation
			<ul style="list-style-type: none"> • Incorporate blast design features (e.g., hole spacing, explosive charge weight, time delay) to meet required noise limits. • Where reasonable and feasible, construction should be carried out during standard daytime working hours. • Schedule high noise activities during normal working hours where feasible and practicable, and plan to complete such activities by 11:00 pm. • Where feasible and practicable, use low noise vehicle and equipment, and only the necessary sized and powered equipment for Project activities. • Shield sensitive receptors from noisy activities. • Enclose or shield stationary noise sources. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional.
O&M	Noise	Project activities may contribute to increased noise levels.	<ul style="list-style-type: none"> • Where feasible and practicable, schedule high noise activities during normal working hours, and plan to complete such activities by 11:00 pm. • Where feasible, use low noise vehicle and equipment, and only the necessary sized and powered equipment for Project activities. • Enclose or shield stationary noise sources. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Maximize offset distance between the Wind Farm and nearby receptors and/or property lines, where practicable. • Maintain a minimum setback distance of greater than 1,000 m between the Wind Farm and sensitive receptors.
Construction, Decommissioning and Rehabilitation	Vibration	Project activities may increase vibration levels.	<ul style="list-style-type: none"> • When feasible and practicable, schedule activities during normal working hours, and plan to complete such activities by 11:00 pm. • Where feasible, use low noise vehicles and equipment, and only the necessary sized and powered equipment for Project activities.

4.5.2 Aquatic Environment

The Project design will incorporate mitigation measures to minimize potential effects on the aquatic environment, and these are provided by phase in Table 4.5-2. The following are generic mitigation

measures that will be adopted for each KI and will be incorporated into the Project's Environmental Protection Plan (EPP):

- Wind turbines will be sited outside the nearby Center Cove River Protected Public Water Supply Area and its full drainage area, thereby avoiding public water supplies.
- Infrastructure will be sited on stable ground to minimize erosion and sedimentation risks, in accordance with a site geotechnical study (AllRock, 2025).
- A minimum buffer of 15 m will be established around the high-water mark of waterbodies to minimize ground and vegetation disturbance.
- Grubbed wood and stripped soil will be stored at least 50 m away from any watercourses, with erosion protection measures implemented until they are transported away for disposal.
- Required permits will be obtained for any work within 15 m of the high-water level. Work will occur during the low flow season where practical.
- Where watercourses must be temporarily diverted or isolated, clean water diversion, coffer dams, or similar will be used. Wastewater will be pumped to vegetated areas or settling basins for treatment.
- In-water works will be limited and aligned with DFO timing windows to protect sensitive fish life stages.
- Fish screens will be installed and regularly maintained at any instream water intakes to prevent fish entrainment.
- If fording is necessary, DFO's Code of Practice for Temporary Fords will be followed.
- Culvert and bridge installation will follow provincial and federal standards, including DFO guidance on fish passage and sediment control.
- Watercourse crossings will be designed to maintain fish passage and convey high flows (e.g., 1:20-year event capacity).
- Heavy equipment will not operate directly in watercourses unless permitted to do instream work.
- Refueling and maintenance of equipment will occur a minimum of 30 m away from waterbodies.
- All equipment will be inspected for leaks and cleaned before use. Spill kits and fire extinguishers will be on site, and operators will be trained in their use.
- During instream works, turbidity monitoring and visual assessments will be conducted to monitor water quality. Post-construction, bank stability will be verified.
- Following construction or decommissioning, disturbed watercourses will be stabilized and restored as close as possible to natural conditions.

- Erosion and sediment control measures will be in place during and after watercourse crossing construction.
- The water withdrawal pipe or intake will be fitted with a screen to protect fish from impingement or entrainment. Measures will be taken to avoid pollution and to minimize disturbance of fish and fish habitat.
- Project construction and operation water consumption will not exceed the permitted annual volume specified in the Project’s water use licences.
- Monitor fish populations for change in community structure, abundance/biomass, and growth.
- Monitor American eel and Atlantic salmon populations for change in abundance and biomass.
- Monitor fish habitat conditions.
- Ensure adherence to all applicable legislation and regulations governing the marine environment.
- Ensure compliance with DFO’s **Fisheries Act** / Aquatic Invasive Species Regulations, Transport Canada’s Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
- Water quality at the marine outfall will be monitored to ensure compliance with applicable regulatory approvals and discharge criteria.
- A monitoring program will be undertaken to determine the presence and prevalence of aquatic invasive species.

Table 4.5-2 Aquatic Environment mitigation and enhancement measures.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
Construction	Groundwater Resources	<ul style="list-style-type: none"> • Possible entry of deleterious substances into the aquifers. • Possible alteration of groundwater flow patterns. 	<ul style="list-style-type: none"> • Plan and schedule work over stable grounds. • Construct infrastructure foundations and temporary stockpiles over impermeable areas.
	Surface Water Resources	<ul style="list-style-type: none"> • Potential entry of deleterious substances into the surface water drainage system. This can result from clearing/grubbing vegetation, excavating/grading, installation of stream crossing structures, fording, and introduction of hydrocarbons (fuel, lubricants), solvents, and other deleterious substances, from construction equipment. • Potential changes in water quantity due to water withdrawal for construction. • Potential changes in drainage pattern due to clearing of areas for construction. 	<ul style="list-style-type: none"> • Avoid public water supply areas and their watersheds to prevent changes in drinking water quality and quantity. • Schedule work during low flow period. • Construction diversion ditches to isolate work areas from watercourses. • Implement erosion control measures. • Maintain equipment in good working conditions to minimize leakage.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<ul style="list-style-type: none"> • Monitor conditions before and after construction to ensure restoration of natural watercourses. • Monitor and document water withdrawal volumes during construction to ensure compliance with authorized limits. • Fit the water intake with a screen to protect fish from impingement or entrainment. • Avoid pollution and minimize disturbance of fish and fish habitat.
	Freshwater Fish and Fish Habitat	<ul style="list-style-type: none"> • Potential change in fish habitat quantity from stream crossing structures or creation of barriers to movement and migration. • Potential change in fish habitat quality from runoff during road construction, installation of crossing structures, laydown areas, or fording. • Potential change in fish health and survival. 	<ul style="list-style-type: none"> • Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • In-water work will be planned to respect DFO timing windows to protect fish in Newfoundland and Labrador. • If fording is required, follow DFO's temporary fording code of practice. • Ensure proper installation of road crossing structures. • Monitor fish populations for change in community structure, abundance/biomass, and growth.
	Marine Fish and Fish Habitat	<ul style="list-style-type: none"> • Transportation of resources and equipment may affect habitat quality. • Possible effects from release of heated effluent through the Braya Renewable's existing effluent disposal system 	<ul style="list-style-type: none"> • Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries. • Monitor effluent quality.
	Fisheries and Aquaculture	<ul style="list-style-type: none"> • Increase in transportation of resources and equipment may affect commercial and recreational fisheries. • Introduction of AIS may affect shellfish aquaculture. 	<ul style="list-style-type: none"> • Regular consultation with commercial and recreational fishers to ensure minimal disruption of fishing activity during shipping. • Ensure vessels comply with Transport Canada guidelines

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
		<ul style="list-style-type: none"> Introduction of AIS could affect sensitive habitats supporting commercial fish species. 	<p>and regulations related to safety, environment, and fisheries.</p> <ul style="list-style-type: none"> Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
	Species at Risk	<ul style="list-style-type: none"> Potential change in American eel and Atlantic salmon habitat quality from runoff during construction of roads. Potential change in American eel and Atlantic salmon habitat health and survival. 	<ul style="list-style-type: none"> Adhere to Environmental Protection Plan (EPP). Adhere to DFO guidance documents, standard mitigation measures, and best management practices. In-water work will be planned to respect DFO timing windows to protect fish in Newfoundland and Labrador. If fording is required, follow DFO's temporary ford code of practice. Ensure proper installation of road crossing structures. Monitor American eel and Atlantic salmon populations for change in abundance and biomass.
	Habitats of Conservation Concern	<ul style="list-style-type: none"> Potential change in Habitats of Conservation Concern during Project Construction Transportation of materials and equipment may affect habitats of conservation concern. 	<ul style="list-style-type: none"> Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries.
	Marine Biosecurity	Introduction of aquatic invasive species from ballast water and hull fouling.	<ul style="list-style-type: none"> Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
Operation and Maintenance	Groundwater Resources	None.	<ul style="list-style-type: none"> None.
	Surface Water Resources	Potential water quality impacts from ongoing vehicle use on access roads. Potential lowering of Willie Jarge and Barrisway Ponds water levels, and	<ul style="list-style-type: none"> Maintain riparian vegetation buffers between watercourses and access roads. Record actual water consumption for HGP and HP during Project operation to

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
		reduction of water quantity downstream due to water withdrawal.	ensure extraction is within authorized limits. <ul style="list-style-type: none"> Monitoring water quantity at the industrial water supply area to ensure adequate environmental flow.
	Freshwater Fish and Fish Habitat	<ul style="list-style-type: none"> Potential change in fish habitat quality from runoff during use of roads. Potential change in fish health and survival. 	<ul style="list-style-type: none"> Site and access roads, including road crossing structures, will be maintained in good condition. Monitor fish habitat quality. Monitor fish populations for change in community structure, abundance/biomass, and growth.
	Marine Fish and Fish Habitat	<ul style="list-style-type: none"> Transit of shipping vessels may affect habitat quality and cause auditory masking. Potential water quality effects from effluent discharge. 	<ul style="list-style-type: none"> Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries. Ensure effluent and wastewater comply with applicable regulatory approvals and discharge criteria. Develop a noise and vibration monitoring plan in consultation with FFA and local environmental non-governmental organizations.
	Fisheries and Aquaculture	<ul style="list-style-type: none"> Vessel activity may result in temporary loss of access to fishing grounds. Introduction of AIS may affect shellfish aquaculture. Introduction of AIS may affect sensitive habitats supporting commercial fish species. 	<ul style="list-style-type: none"> Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries. Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. Implement an AIS monitoring plan.
	Species at Risk	<ul style="list-style-type: none"> Potential change in American eel and Atlantic salmon habitat quality from runoff during use of roads. Potential change in American eel and Atlantic salmon health and survival. 	<ul style="list-style-type: none"> Site and access roads will be maintained in good condition. Monitor American eel and Atlantic salmon populations for change in abundance and biomass.
	Habitats of Conservation Concern	<ul style="list-style-type: none"> Potential change in Habitats of Conservation Concern during Project Operations 	<ul style="list-style-type: none"> Ensure vessels comply with Transport Canada guidelines and regulations related to

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
	Marine Biosecurity	<ul style="list-style-type: none"> • Transportation of materials and equipment may affect habitats of conservation concern. • Introduction of aquatic invasive species from ballast water and hull fouling. 	<ul style="list-style-type: none"> • safety, environment, and DFO guidelines and regulations for fisheries. • Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. • Implement an AIS monitoring plan.
Decommissioning and Rehabilitation	Groundwater Resources	<ul style="list-style-type: none"> • Possible entry of deleterious substances into the aquifers. • Possible alteration of groundwater flow patterns. 	<ul style="list-style-type: none"> • Conduct decommissioning work over stable grounds. • Dispose and store wastes over impermeable areas.
	Surface Water Resources	<ul style="list-style-type: none"> • Potential entry of deleterious substances into the surface water drainage system. This can result from removal of stream crossing structures, fording, rehabilitation works, and introduction of hydrocarbons (fuel, lubricants), solvents, and other deleterious substances due to equipment operations. • Potential changes in water quantity due to water withdrawal for decommission works. • Potential changes in drainage pattern during decommission works. 	<ul style="list-style-type: none"> • Avoid public water supply areas and their watersheds to prevent changes in drinking water quality and quantity. • Schedule work during low flow period. • Construct diversion ditches to isolate work areas from watercourses. • Implement erosion control measures. • Maintain equipment in good working conditions to minimize leakage. • Monitor conditions before and after work to ensure restoration of natural watercourses.
	Freshwater Fish and Fish Habitat	<ul style="list-style-type: none"> • Potential change in fish habitat quality from runoff during use of roads. • Potential change in fish health and survival. 	<ul style="list-style-type: none"> • Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Limit any in-stream work.
	Marine Fish and Fish Habitat	<ul style="list-style-type: none"> • Transit of shipping vessels may affect habitat quality. 	<ul style="list-style-type: none"> • Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries.
	Fisheries and Aquaculture	<ul style="list-style-type: none"> • Transportation of materials and equipment may affect commercial and recreational fisheries. • Introduction of AIS may affect shellfish aquaculture. 	<ul style="list-style-type: none"> • Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
		<ul style="list-style-type: none"> • Introduction of AIS may affect sensitive habitats supporting commercial species. 	<ul style="list-style-type: none"> • Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. • Continue AIS monitoring until shipping activity associated with decommissioning ceases.
	Species at Risk	<ul style="list-style-type: none"> • Potential change in American eel and Atlantic salmon habitat quality from runoff during use of roads. • Potential change in American eel and Atlantic salmon health and survival. 	<ul style="list-style-type: none"> • Site and access roads will be maintained in good condition. • Monitor American eel and Atlantic salmon populations for change in abundance and biomass.
	Habitats of Conservation Concern	<ul style="list-style-type: none"> • Transportation of materials and equipment may affect habitats of conservation concern. 	<ul style="list-style-type: none"> • Ensure vessels comply with Transport Canada guidelines and regulations related to safety, environment, and fisheries.
	Marine Biosecurity	<ul style="list-style-type: none"> • Introduction of aquatic invasive species from ballast water and hull fouling 	<ul style="list-style-type: none"> • Ensure compliance with DFO Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. • Continue AIS monitoring until shipping activity associated with decommissioning ceases.
Unplanned Events	Groundwater Resources	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions could affect groundwater quality. 	<ul style="list-style-type: none"> • Ensure containment and rapid cleanup of spills/releases.
	Surface Water Resources	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions could affect surface water quality. 	<ul style="list-style-type: none"> • Ensure containment and rapid cleanup of spills/releases. • Identify and resolve water quality issues via real-time monitoring and alert system.
	Freshwater Fish and Fish Habitat	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions could affect fish habitat and fish health and survival. 	<ul style="list-style-type: none"> • Ensure containment and rapid cleanup of spills/releases.
	Marine Fish and Fish Habitat	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions, and accidents on vessels could result in oil spills and introduction of harmful substances into the marine environment. 	<ul style="list-style-type: none"> • Ensure containment and rapid cleanup of spills/releases. • Maintain inventory of oil spill response equipment.
	Fisheries and Aquaculture	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions, and accidents on vessels could result in 	<ul style="list-style-type: none"> • Ensure containment and rapid cleanup of spills/releases.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
		oil spills and introduction of harmful substances affecting commercial and recreational fisheries.	<ul style="list-style-type: none"> Maintain inventory of oil spill response equipment. Consider closure of fisheries if there is potential of contamination.
	Species at Risk	<ul style="list-style-type: none"> Spills/releases, fire, and/or explosions could affect American eel habitat and eel health and survival. 	<ul style="list-style-type: none"> Ensure containment and rapid cleanup of spills/releases.
	Habitats of Conservation Concern	<ul style="list-style-type: none"> Spills/releases, fire, and/or explosions, and accidents on vessels could result in oil spills and introduction of harmful substances that could affect habitats of conservation concern. 	<ul style="list-style-type: none"> Ensure containment and rapid cleanup of spills/releases. Maintain inventory of oil spill response equipment.
	Marine Biosecurity	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> None.

4.5.3 Terrestrial Environment

Standard mitigation and enhancement measures that are applicable to the Terrestrial Environment VC are provided by Project phase in Table 4.5-3. Project-specific plans and studies (e.g., Noise Impact Study, Ice Throw Assessment) will also include mitigation measures that are applicable to this VC.

Table 4.5-3 Terrestrial Environment mitigation and enhancement measures.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
Construction	All	<ul style="list-style-type: none"> Loss and fragmentation of wildlife habitat due to vegetation clearing. Change in ecological community diversity as a result of loss of forest. 	<ul style="list-style-type: none"> Project footprint and disturbed areas will be minimized and limited to the space required to accommodate necessary infrastructure. Existing roads, trails, and disturbed areas will be used wherever feasible. Clearing, grubbing, and topsoil overburden removal will be clearly identified in the field using flagging and survey stakes. Vegetation removal will be limited to within the construction footprint area, and as little vegetation as possible will be removed. <u>During all construction activities associated with the linear corridor, best management practices (BMPs) will be followed, including avoidance of critical wildlife breeding seasons.</u>
	Avifauna	<ul style="list-style-type: none"> Possible mortality of nesting birds. Loss and/or degradation of nesting habitat. Disturbance and/or displacement of nesting birds. 	<ul style="list-style-type: none"> Site clearing and grubbing will be conducted outside the temporal window of the bird breeding season where feasible. If vegetation must be removed during the bird nesting season of April 1 to

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<p>August 31, mitigations will be applied in accordance with the Migratory Birds Convention Act.</p> <ul style="list-style-type: none"> • Pre-clearing surveys for active migratory bird nests will be carried out for work done during the breeding season, and buffer / set-back distances from active nests will be established. • A qualified Avian Biologist will be present during clearing activities to supervise vegetation removal and carry out nest surveys. • A buffer zone shall be established around the active bird nest or confirmed bird nesting activity if one is discovered. The radius of the buffer will vary depending on the species, level of disturbance, and landscape context. The buffer will be developed in consultation with NL Wildlife Division. The nest is expected to be protected by the minimum buffer area of 10 m surrounding the nest from minor work such as vegetation clearing, building access roads, general heavy machinery use, and vehicle operation. • <u>A qualified third-party shall undertake a Short-eared Owl survey within seven days of any ground disturbance required for the Project, should it occur during the Short-eared Owl breeding season (May 15 – August 15). Surveys will be undertaken in consultation with NL DFAL-WD, and in following with survey protocols provided by NL DFAL-WD. All required permits will be obtained prior to completing this work, including a Section 18 permit under the NL ESA</u>
	Bats	<ul style="list-style-type: none"> • Loss and/or degradation of habitat. • Reduced habitat availability for bats • Disturbance and/or displacement of bats. • Disturbance to bat maternity roosts from anthropogenic activity. 	<ul style="list-style-type: none"> • Project infrastructure will be micro-sited where possible to avoid high risk areas for bats, if any are identified during baseline studies. • During the bat roosting season, any trees proposed for removal and any suitable rock crevices or caves in areas proposed for blasting will be searched by a qualified Biologist for signs of maternity roosts. A buffer will be established around any active roosts found within the construction footprint site, in consultation with NL WD. • <u>If an active bat colony is discovered, a no-cut buffer of 250-metres will be applied until September 1, after which a</u>

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<p><u>subsequent survey will be undertaken to confirm that bats are no longer present. Roosting locations will be reported to NL DFAL-WD immediately, including photographic records and geospatial data (including GPS coordinates and maps) of bat colonies/residences. In addition, colony trees shall be maintained on the landscape.</u></p>
	<p>Fauna Avifauna Bats</p>	<ul style="list-style-type: none"> • Loss and fragmentation of wildlife habitat due to sub-surface excavation activities. • Possible mortality and/or harm to terrestrial wildlife. • Disturbance to wildlife due to construction noise and vibration. 	<ul style="list-style-type: none"> • Limit the affected area of blasting to minimize disturbance to wildlife while carrying out blasting operations in accordance with relevant Federal and Provincial guidelines and standards. • Time delay blasting cycles or blast mats will be used to control debris generated from blasting. • Blasting will only occur in areas that have been cleared of vegetation. • Prior to blasting, a qualified Biologist is to undertake an area search of the intended blasting area to determine whether wildlife is present on the day of blasting. • If wildlife is encountered in the blasting zone, deterrence measures are to be employed, up to implementation of a delay in blasting until the wildlife have vacated the area. • All blasting activities will be overseen by an Environmental Monitor. The designated monitor will check the site prior to and during blasting activities to ensure compliance with the Blasting Plan.
	<p>Fauna Avifauna Bats</p>	<ul style="list-style-type: none"> • Possible mortality, harm, and/or harassment to wildlife due to construction activities. • Disturbance to wildlife. 	<ul style="list-style-type: none"> • An Environmental Monitor will be present during construction activities such as clearing vegetation, dewatering, and blasting to ensure adherence to environmental regulations.
	<p>Fauna Avifauna Bats Insects Lichens</p>	<ul style="list-style-type: none"> • Possible destruction and/or fragmentation of avian SAR habitat. • Change in mortality risk – harm, harassment, and/or killing of SAR. 	<ul style="list-style-type: none"> • Staff will receive formal training on how to recognize SAR that may be present in the PA and the proper procedure to follow if SAR are encountered as per the EPP. • Construction work must stop immediately within 10 m of a SAR observation until a qualified Biologist can confirm the species has vacated the construction disturbance footprint. If the species is not present within the vicinity of the previous observation after a 24-hour period, work can resume.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
	Flora Lichens	<ul style="list-style-type: none"> Loss and fragmentation of rare plant or lichen habitat 	<ul style="list-style-type: none"> SAR sightings will be reported to NL WD. Upon discovery of a previously unknown SAR, work will be stopped until NL WD can be consulted. Project micro-siting, including the twinning of lines along existing linear corridors such as transmission lines and roads, where practicable, will be done to reduce the volume of vegetation removal and limit damage associated with construction and maintenance activities. Project infrastructure will be micro-sited to avoid rare plants or lichens where possible. Before any clearing of suitable habitat types for rare lichen species, or habitat adjacent to such suitable habitat types, surveys should be conducted to identify any existing thalli. Where boreal felt lichen exist within or adjacent to proposed construction sites, thalli will be translocated outside of the construction zone and beyond associated buffers. Other rare lichen species like the blue felt lichen require a buffer as the crustose form of the species will not as easily survive transplanting. If observed, an appropriate buffer will be established for this species through consultation with NL WD.
	Wetlands	<ul style="list-style-type: none"> Change in wetland and waterbody quantity and function due to Project construction. 	<ul style="list-style-type: none"> Maintain undisturbed buffer strips more than 30 m wide surrounding wetlands and waterbodies, except for where access roads are close to such crossings. Permanent infrastructure will be sited outside of wetlands to the extent feasible. Otherwise, a Permit to Alter a Body of Water will be sought from NL DECC WRMD. <u>If the wetland has an intake and discharge of water where there is potential for fish and fish habitat, DFO should also be consulted. In addition to the Permit for Alterations to a Body of Water, the proponent may also be required to submit a Request for Review under the Fisheries Act.</u> Store any stockpiled materials at least 30 m away from wetlands.

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<ul style="list-style-type: none"> • Site maintenance, vehicle maintenance, and fueling will be done in specified areas more than 30 m away from wetlands and waterbodies. Such locations will include drainage control features. • Where construction activities occur within 30 m of a wetland, install and maintain construction fencing to clearly define the construction footprint area to prevent damage to vegetation. • Erosion and sediment control measures will be implemented prior to and during construction near wetlands and waterbodies to prevent siltation and disturbance. • Maintain erosion and sediment control measures until re-vegetation of disturbed areas is complete. • Access road runoff will be diverted through drainage ditches into vegetated areas or through sediment barriers to prevent exposed soil or road materials from entering waterbodies or wetlands. • In siting the quarry necessary for the Project, avoidance of wetlands will be mandatory for North Atlantic.
Operation and Maintenance	Fauna Avifauna Bats	<ul style="list-style-type: none"> • Disturbance to wildlife caused by noise and light from Project infrastructure, and possible avoidance of the area. 	<ul style="list-style-type: none"> • Project lighting will be limited to that which is necessary for safe and efficient Project activity. • A wildlife-friendly lighting plan will be followed.
	Bats Avifauna	<ul style="list-style-type: none"> • Possible bird or bat mortality as a result of collision with wind turbines. 	<ul style="list-style-type: none"> • North Atlantic will consult with NL WD and design and implement a science-based Bird and Bat Mitigation and Monitoring Plan. This plan will consider deterrents, optimized smart curtailment based on real data (which continues to be collected through 2025 and beyond), and thermal imaging/AI systems for real-time detection and mitigation for bats and raptors and SAR. • Continue to collect bat and bird data through pre-Construction, post-Construction and O&M phases to inform smart curtailment. • Based on the extensive bat dataset from 2023-2025, determine which turbines pose the greatest risk to bats. Discuss options for optimized smart curtailment of select turbines with NL WD. • A post-Construction mortality monitoring program (PCMP) will be established, and carcass searches will be conducted

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<p>at all wind turbines between April and October for the first year (and beyond, if necessary). The mortality monitoring program will be developed in consultation with the NL WD. New mitigation measures will be implemented if high fatality rates are observed.</p> <ul style="list-style-type: none"> • Install bird flight diverters in areas of relatively high risk of collision with infrastructure.
	Flora Lichens	<ul style="list-style-type: none"> • Disturbance to flora and rare lichen species from vegetation control measures implemented around transmission lines and substations 	<ul style="list-style-type: none"> • Vegetation control measures will be implemented in accordance with industry standards and best practices (e.g., NL Hydro vegetation management program). • Herbicides will be applied in accordance with the federal Pest Control Products Act, administered by the Pest Management Regulatory Agency, and the provincial Environmental Protection Act and its associated Pesticide Control Regulations. • If rare plant or lichen SAR are discovered within the vegetation clearing area, their presence will be reported to NL WD. Where appropriate, buffer zones will be established in consultation with NL WD. If an area containing SAR must be cleared, other mitigation measures (e.g., transplanting) will be considered, in accordance with guidance received from NL WD. • No herbicides will be used in the Centre Cove River PPWSA. Manual vegetation clearing efforts (e.g., tree trimming and brush clearing) will be undertaken in this area.
	Bats	<ul style="list-style-type: none"> • Reduced habitat availability for bats • Disturbance to bat maternity roosts from anthropogenic activity. 	<ul style="list-style-type: none"> • Bat roosting surveys will be conducted on any structures within the PA and preventative measures will be implemented to ensure bats do not occupy buildings. Any bats detected within buildings will be left undisturbed until after the maternity season (in the case of maternity roosts) and Canadian Wildlife Health Cooperative guidelines will be followed.
Decommissioning and Rehabilitation	Flora Fauna Avifauna Bats	<ul style="list-style-type: none"> • Loss and fragmentation of wildlife habitat due to vegetation clearing. 	<ul style="list-style-type: none"> • Rehabilitation will be initiated within all temporary construction and decommissioning areas as appropriate to the type of habitat that was removed,

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			<p>i.e., replant forested areas using native stock.</p> <ul style="list-style-type: none"> • <u>If an active bat colony is discovered, a no-cut buffer of 250-metres will be applied until September 1, after which a subsequent survey will be undertaken to confirm that bats are no longer present. Roosting locations will be reported to NL DFAL-WD immediately, including photographic records and geospatial data (including GPS coordinates and maps) of bat colonies/residences. In addition, colony trees shall be maintained on the landscape.</u> • <u>A qualified third-party shall undertake a Short-eared Owl survey within seven days of any ground disturbance required for the Project, should it occur during the Short-eared Owl breeding season (May 15 – August 15). Surveys will be undertaken in consultation with NL DFAL-WD, and in following with survey protocols provided by NL DFAL-WD. All required permits will be obtained prior to completing this work, including a Section 18 permit under the NL ESA</u>
<p>Construction</p> <p>Operation and Maintenance</p>	<p>Fauna Avifauna Bats</p>	<ul style="list-style-type: none"> • Possible wildlife interactions with personnel, equipment, and vehicles 	<ul style="list-style-type: none"> • A Wildlife Response Protocol will be developed and implemented. • The work area will be kept clean and free from leftover foods which can attract wildlife. • Project personnel are to record and report all wildlife sightings and human-wildlife interactions and conflicts to the Environmental Coordinator. • Human-wildlife interactions will be reported to NL FFA.
<p>Decommissioning and Rehabilitation</p>	<p>Fauna Avifauna Bats</p>	<ul style="list-style-type: none"> • Mortality to wildlife as a result of vehicles using access roads. 	<ul style="list-style-type: none"> • Establish Project speed limits that are protective of wildlife. • Post signage and monitor for adherence to the limits set. • Inform staff to be vigilant for wildlife while driving on site. • Roadkill will be removed from Project roads to reduce vehicular collision risk. • Include speed limit requirements in construction and operations wildlife trainings.
<p>Accidents and Malfunctions</p>	<p>All</p>	<ul style="list-style-type: none"> • Spills/releases, fire, and/or explosions could affect terrestrial KIs. 	<ul style="list-style-type: none"> • Fire detection and protection systems will be installed in high-risk areas such as fuel and hazardous material storage. • Hazardous products will be stored according to industrial requirements and standards, and safely secured so that

Project Phase	Key Indicator	Interaction	Mitigation / Enhancement
			access is limited to authorized personnel. <ul style="list-style-type: none"> • All spills will be reported and cleaned up as soon as feasible, with contaminated soils removed from site for disposal at an approved/licensed location. • Firefighting equipment will be deployed to extinguish fires, if applicable. • The Emergency Response Plan and Hazardous Materials Training Plan, which specify the actions required both to prevent and respond to any release of chemicals to avoid water and soil contamination, will be adhered to.

4.5.4 Land and Resource Use

Standard mitigation and enhancement measures applicable to the LRU VC are provided by phase in Table 4.5-4. Project-specific plans (e.g., Domestic Wood Cutting Consultation Plan) will also include mitigation measures that are applicable to this VC.

Table 4.5-4 Land and Resource Use mitigation and enhancement measures.

Project Phase	Key Indicator	Interaction	Mitigation Measure
Construction	Land use planning and development control	<ul style="list-style-type: none"> • Project activities may be incompatible with designated land uses 	<ul style="list-style-type: none"> • Apply for and obtain appropriate permits within the Municipal Planning Areas of Sunnyside and Come By Chance. • Avoid Protected Public Water Supply Areas where possible and if required apply for a Permit to Develop in a Protected Public Water Supply Area. • Apply for and obtain all other necessary permits required for the Project.
	Industrial and commercial land use	<ul style="list-style-type: none"> • Temporary disturbance to nearby properties (e.g., noise, dust) • Periodic increased traffic delays 	<ul style="list-style-type: none"> • Engagement with other land users to understand rights and interests and to avoid conflicts. • Engagement with provincial departments and agencies to understand and adhere to requirements. • Vehicles and equipment are to be maintained in good working order. • Dust suppression to be used as required.

Project Phase	Key Indicator	Interaction	Mitigation Measure
			<ul style="list-style-type: none"> • Schedule transport of oversize loads outside of peak traffic hours. • Transportation of large wind turbine components to be conducted during reduced traffic hours (i.e., overnight).
	Tourism and recreation	<ul style="list-style-type: none"> • Project clearing may result in alteration of recreational land use near the Project due to changes in resource accessibility • Activities may reduce access to or quality of recreational land use • The Project may increase the noise levels at some cabin locations 	<ul style="list-style-type: none"> • Engagement with other land users to understand rights and interests and to avoid conflict. • Engagement with provincial departments and agencies to understand and adhere to requirements. • Vehicles and equipment are to be maintained in good working order. • Dust suppression to be used as required. • Mitigation from Noise Study to be implemented. • Transportation of large wind turbine components to be conducted during reduced traffic hours (i.e., overnight).
	Harvesting	<ul style="list-style-type: none"> • Project clearing may result in alteration of harvesting due to changes in resource accessibility 	<ul style="list-style-type: none"> • Engagement with local stakeholders. • Engagement with other land users to understand rights and interests and to avoid conflict. • Engagement with provincial departments and agencies to understand and adhere to requirements. • Route electrical infrastructure and access roads along existing rights-of-way wherever possible to reduce infrastructure footprint.
Operation and Maintenance	Harvesting	<ul style="list-style-type: none"> • Project infrastructure may result in alteration of harvesting due to changes in resource accessibility 	<ul style="list-style-type: none"> • Engagement with local stakeholders.
Decommissioning and Rehabilitation	Industrial and commercial land use	<ul style="list-style-type: none"> • Temporary disturbance to nearby properties • Periodic increased traffic delays 	<ul style="list-style-type: none"> • Engagement with local stakeholders. • Vehicles and equipment are to be maintained in good working order. • Dust suppression to be used as required. • Transportation of large wind turbine components to be conducted during reduced traffic hours (i.e., overnight).

Project Phase	Key Indicator	Interaction	Mitigation Measure
	Tourism and recreation	<ul style="list-style-type: none"> • Temporary disturbance to nearby properties • Periodic increased traffic delays. • Project clearing for infrastructure removal may result in the alteration of recreational land use due to changes in resource accessibility • Closure activities may reduce access to or quality of tourism and recreation 	<ul style="list-style-type: none"> • Engagement with local stakeholders. • Vehicles and equipment to be maintained in good working order. • Dust suppression to be used as required. • Transportation of large wind turbine components to be conducted during reduced traffic hours (i.e., overnight).
	Harvesting	<ul style="list-style-type: none"> • Project infrastructure may result in the alteration of harvesting land use due to changes in resource accessibility 	<ul style="list-style-type: none"> • Engagement with local stakeholders.
Accidents and Malfunctions	Industrial and commercial land use	<ul style="list-style-type: none"> • Accidents and malfunctions may interact with the operations of other properties 	<ul style="list-style-type: none"> • Assign designated storage areas for hazardous materials, with secondary containment where applicable. • Project vehicles will be maintained regularly and equipped to manage seasonal changes. • Transportation of large wind turbine components to be conducted during reduced traffic hours (i.e., overnight). • Installation of fire detection and protection systems in high-risk areas, such as fuel and hazardous material storage, and hydrogen transfer pipelines.
	Tourism and recreation	<ul style="list-style-type: none"> • Accidents and malfunctions may reduce access to or quality of tourism and recreation 	
	Harvesting	<ul style="list-style-type: none"> • Accidents and malfunctions may reduce access to or quality of harvesting. 	

4.5.5 Heritage and Cultural Resources

Standard mitigation measures that are applicable to the Heritage and Cultural Resources KIs are provided for all Project phases in Table 4.5-5 and discussed in detail in Appendix F. Based on the HRIA, the best approach is to avoid disturbance to a documented site. For potential sites of heritage and cultural importance, having a Contingency Plan in place for the discovery of a candidate site will mitigate disturbance.

Table 4.5-5 Heritage and Cultural Resources Mitigation and Enhancement Measures.

Project Phase	Key Indicator	Interaction	Mitigation Measure
All	Historic and Archaeological Resources	<ul style="list-style-type: none"> Physical disturbance of the material or site causing a loss of integrity and/or quality. 	<ul style="list-style-type: none"> Avoidance of the two registered archaeological sites (CIAk-02 and CIAI-04) in or near the PA, and two identified HPAs (HPA-04 and HPA-12) situated within the PA. Note that HPA-12 encompasses CIAk-02. Avoidance of any other structures or features eligible for registration with the PAO. Completion of an Archaeological Mitigation Phase of the HRIA prior to conducting any Project activities that may alter or disturb any existing structural remains or terrain identified in the HRIA as having high potential for existing and/or as-of-yet undiscovered historic and archaeological resources.
	Architectural Resources	<ul style="list-style-type: none"> Physical disturbance of the material or site causing a loss of integrity and/or quality. 	<ul style="list-style-type: none"> Avoidance of any structures or features eligible for registration with Heritage NL or as a Municipal Heritage Site.

As recommended in the HRIA, a detailed Contingency Plan would describe the measures and procedures to follow and the personnel to be contacted at the PAO if any suspected Historic and Archaeological Resources are encountered on the surface or are unearthed during any phase of the Project. The Contingency Plan would be provided to and discussed with all personnel working on the Project, particularly those involved in ground disturbing activities.

4.5.6 Socio-Economic Environment

Standard mitigation measures that are applicable to the socio-economic environment KIs are provided for all Project Phases in Table 4.5-6. Project-specific plans and studies (e.g., Workforce and Employment Plan, Waste Management Plan, Transportation Impact Study and Traffic Management Plan) will also include mitigation measures that are applicable to these VCs.

Table 4.5-6 Socio-economic Environment mitigation and enhancement measures.

Project Phase	Valued Component	Key Indicator	Mitigation Measure
All	Communities	<ul style="list-style-type: none"> Population Demographics 	<ul style="list-style-type: none"> Hire locally/regionally where possible. Apply diversity, equity and inclusion policies.

Project Phase	Valued Component	Key Indicator	Mitigation Measure
		<ul style="list-style-type: none"> Community Health and Wellbeing 	<ul style="list-style-type: none"> Institute workers' health and safety programs to comply with regulations and to promote the health, safety and wellbeing of workers. Ensure contractor compliance with workers' health and safety regulations. Hire locally/regionally where possible. Enter into a Regional Community Benefits Program to ensure benefits to municipalities and to enhance local services.
		<ul style="list-style-type: none"> Infrastructure and Services 	<ul style="list-style-type: none"> Potentially house non-resident workers in temporary accommodation facilities located at the Bull Arm Fabrication Site which have onsite potable water and sewage treatment. Implement traffic management measures. Develop and implement a waste management and waste reduction plan for the Project with special emphasis on waste during Construction and Decommissioning and Rehabilitation. Work with regional waste management facilities and service providers to address waste management needs. Work with educational institutions to address training needs.
	Economy, Employment and Business	<ul style="list-style-type: none"> Economy 	<ul style="list-style-type: none"> Procure goods and services provincially as much as possible to the extent that they are available.
		<ul style="list-style-type: none"> Employment 	<ul style="list-style-type: none"> Implement commitments from the Workforce and Employment Plan.
		<ul style="list-style-type: none"> Business 	<ul style="list-style-type: none"> Procure goods and services locally, regionally and provincially as much as possible to the extent that they are available.

4.5.7 Human Health and Quality of Life

Standard mitigation and enhancement measures applicable to the Human Health and Quality of Life VC are provided by phase in Table 4.5-7. Project-specific plans (e.g., the Traffic Management Plan) will also include mitigation measures that are applicable to this VC.

Table 4.5-7 Human Health and Quality of Life Mitigation and Enhancement Measures.

Project Phase	Key Indicator	Interaction	Mitigation Measure
Operation and Maintenance	Shadow Flicker	<ul style="list-style-type: none"> Project activities may generate shadow flicker during the daytime under particular conditions, causing visual nuisance. 	<ul style="list-style-type: none"> No specific mitigation measures are planned to address shadow flicker since exceedances of the 30 shadow hours per year threshold are not anticipated. Stakeholder engagement will continue throughout the Project.
Operation and Maintenance	Ice Throw	<ul style="list-style-type: none"> Project activities may result in ice throw and ice fall hazard, posing a risk of injury to people and animals or property damage. 	<ul style="list-style-type: none"> North Atlantic to further investigate ice throw mitigation technologies and consider implementation if required (heated blades, low friction coatings). Ice protection devices (either mobile units deployed as needed, or permanent installations at each wind turbine) will be further investigated and considered for implementation to provide an entryway for workers to leave their vehicle and enter the wind turbine base while being protected from the risk of falling ice. Add public education and warning signage that explain hazards to prevent members of the public from entering maximum ice throw areas during periods of rotor icing. Educate and train employees in potential risks in accordance with best practices and guidelines. North Atlantic to further develop Project site plan and if required, critical equipment at the substation can be protected with casing/ caging or moved to mitigate consequence of ice throw.

Shadow flicker

The shadow flicker analysis revealed that the effects on receptors will be minimal, with expected shadow flicker not exceeding 30 hours per year or 30 minutes per day. Consequently, at this time no specific mitigation measures are planned to address shadow flicker.

Stakeholders will continue to be engaged throughout the Project to identify any issues and ensure their well-being is considered. Regular updates and consultations will be conducted to maintain open communication and address any concerns.

Ice throw

Planned roads for O&M access are within the ice throw zones of all 55 wind turbines, posing potential risks to motorists on access roads. Transmission lines are within the ice throw zones of wind turbines HAT-05, DNV-04, and DNV-05, risking damage and power outages. Collector lines and substations are similarly at risk, with limited mitigation measures available.

The following risk mitigation measures will be employed to address the risks associated with ice throw:

- Anti-icing or de-icing technologies will be further investigated and considered for implementation if required to reduce the anticipated rotor icing periods and mitigate the likelihood of ice throw.
- Ice protection devices (either mobile units deployed as needed, or permanent installations at each wind turbine) will be further investigated and considered for implementation to provide an entryway for workers to leave their vehicle and enter the wind turbine base while being protected from the risk of falling ice.
- After further development of the Project site plan and if required, critical equipment at the substation can be protected with casing/ caging or moved to mitigate consequence of ice throw.
- PPE and training will be provided to workers, in accordance with CanREA Best Practices recommendations. Workers will be trained about the risks of ice throw, and made aware of active rotor icing events, and will have adequate PPE.

4.6 Plans & Environmental Management

North Atlantic recognizes that safety is a fundamental element of everyday operations and is committed to preventing the accidental loss of any of its resources, both human and physical. Employees, Supervisors, and Contractors are responsible for the company's overall safety initiatives.

Accordingly, North Atlantic will do everything that is practical and reasonable to provide their employees and contractors with a safe working environment by continuing to meet and/or exceed OHS and related regulatory requirements. This shall be achieved through the development and implementation of comprehensive policies and procedures, education in hazard and incident reduction, mandatory training and orientation for employees and contractors, and a commitment to review and continuously improve the corporate safety management system.

The cooperation from all employees is vital to the success of the safety management system. Safety must be an integrated part of every job.

North Atlantic is devoted to developing a system of responsibility, measuring key performance indicators, providing its employees and contractors with sound leadership, and leading by example. These are the cornerstones of developing a sustainable safety culture.

4.6.1 Environmental Policy

North Atlantic is committed to the protection and preservation of the environment through regulatory compliance and the continuous review of site operations. Recognizing that all management and employees have a role to play in achieving environmental protection, the company has formulated the following guiding principles:

- All operations will comply with government legislation, corporate policy and applicable industry standards concerning the protection of the environment and the public;
- Ensure that environment issues associated with the business are identified, evaluated and mitigated during project planning, implementation and operations;
- Ensure the operations allow for the efficient use of energy and other resources;
- Identify and minimize environmental hazards;
- Communicate this policy to ensure all employees understand and implement these guiding principles in their daily work;
- To report to the relevant authority all occurrences, including spillage or discharge that may have an adverse effect on the environment; and
- Having available at all times, sufficient stocks of equipment and materials to mitigate the effects of any spillage or discharge of any environmentally damaging substances.

4.6.2 HSE Management System

A Health, Safety, & Environmental Management System (HSEMS) is a set of processes and procedures that help an organization manage its health, safety and environmental risks. It can be used to identify, assess, control, and monitor health, safety, and environmental risks. A HSEMS can be designed to meet specific needs and should consider the size, type, and the nature of the Project component. Good and effective management principles provide a sound basis for improving health, safety, and environmental performance.

A few key characteristics make up a good HSEMS. A well-run system will have clear policies and procedures in place and a commitment from management to follow these procedures. Employees should

also be regularly trained on how to safely perform their jobs and effectively communicate between workers and management on health, safety, and environmental concerns. Finally, a good HSEMS will have ongoing monitoring and evaluation to ensure that it works as intended. An effective HSEMS is intended to achieve the following benefits through its implementation:

- Minimize the risks of workplace incidents and injuries;
- Comply with relevant health and safety laws and regulations;
- Improve employee morale and motivation;
- Enhance the company's image and reputation;
- Reduce workers' compensation costs;
- Avoided or reduced negative environmental effects;
- Pro-active rather than re-active environmental and community management planning and control;
- Improved operational structure and efficiency with regards to environment management;
- Achieve a level of environmental performance that goes beyond compliance with applicable laws;
- Effective management of environmental risks; and
- Efficient use of resources.

By putting together, a comprehensive HSEMS, North Atlantic can create a safer workplace for everyone. It is an investment that will pay off in the long run, both in terms of preventing accidents and injuries and in terms of compliance with health, safety, and environmental legislation.

Implementation of the North Atlantic HSEMS enables the company to develop and implement a Health, Safety, and Environmental (HSE) policy and objectives which consider legal requirements, and application of risk management practices and continuous improvement processes. Continuous improvement is at the core of HSEMS by virtue of the plan/do/check/act (PDCA) cycle. The success of the system depends on commitment from all levels and functions of the organization, and especially from senior management.

Figure 4.6-1 show the steps use the PDCA process and how it is used to devise a structure for use in developing a safety management system. By having a specific process, a structure is provided from which a map can be developed for the organization to follow. In addition, the PDCA provides a dynamic format that reflects how the process is not static and is in continual movement and renewal.

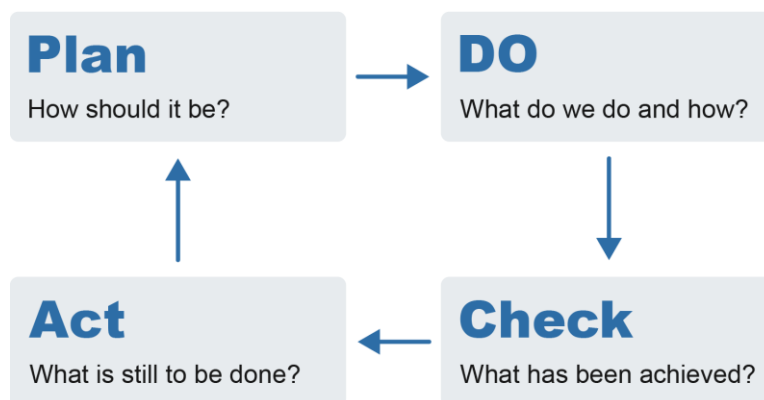


Figure 4.6-1 The four phases in the Plan-Do-Check-Act cycle.

The four phases in the Plan-Do-Check-Act cycle involve:

- **Plan:** Establish the objectives and processes necessary to deliver results in accordance with the organization's HSE policy.
- **Do:** Implement the plan.
- **Check:** Monitor and measure the process against the OHS Policy, objectives, and legal requirements, and report results.
- **Act:** Act to continually improve performance.

4.6.2.1 Roles and Responsibilities

President/General Manager

- Overall responsibility and accountability for health & safety performance at the workplace;
- Responsible for showing leadership on health & safety within the organization;
- Develop a strong, positive health and safety culture throughout the company and communicate it to all managers;
- Proactively promoting health and safety as part of the organization's culture & values;
- Monitoring to ensure the organization's standards are being met and achieving the right results;
- Ensure that the HSEMS is reviewed on a regular basis, maintained, and meets legislative requirements;

- Ensure that adequate resources are provided to meet the organization's HSE objectives;
- Include HSE activities & initiatives in the overall business plan; and
- Review annually the North Atlantic HSE and Right to Work (RTW) Policies.

Manager/Supervisor

- Know and apply the North Atlantic HSEMS;
- Ensure the health and safety of employees under their supervision;
- Hold employees accountable for their individual safety;
- Ensure employees use PPE or any other devices or apparel & are provided with instructions on its care & use;
- Maintain a healthy and safe workplace, systems, equipment, and tools;
- Ensure training, instruction and supervision is provided to employees;
- Advise and train workers of the hazards they may face on the job;
- Instruct employees in HSE Safe Operating Procedures, Programs, Safe Work Practices / Procedures;
- Identify, report, and correct unsafe conditions and workplace hazards to the HSE Specialist;
- Report all incidents, safety issues, concerns, &/or recommendations to the HSE Specialist;
- Participate in incident investigations as required;
- Participate in workplace inspections;
- Co-operate with the OHS Committee / Workplace Health and Safety Regulations (WHSR); and
- Co-operate with regulatory government departments/agencies.

Health, Safety & Environment (HSE) Specialist

- Responsible for the development and implementation of the HSEMS;
- Review the HSEMS in its entirety at least every 3 years;
- Ensure that the HSEMS is maintained and compliant with legislative requirements;
- Ensure that new employees are provided with timely orientation;
- Ensure employees are made aware of and understand the contents of this manual and accompanying Safe Operating Procedures, Programs and Safe Work Practices/Procedures;

- Ensure adequate availability of health and safety information, instruction, materials, and assistance to all employees;
- Ensure that a WHMIS inventory is on site and maintained;
- Review all correspondence and records and take appropriate action where applicable;
- Ensure the formation of OHS Committee's &/or WHSR at applicable worksites and co-operate with them;
- Promote safety and take a proactive approach to hazard identification and mitigation;
- Notify the President, General Manager & Deputy Minister Service NL of a serious workplace injury;
- Co-operate with regulatory government departments/agencies;
- Participate in incident investigations as required;
- Participate in workplace inspections;
- Co-operate with the OHS Committee /WHSR; and
- Co-operate with regulatory government departments/agencies.

Employee

- Protect their own health and safety and the safety of others;
- Participate in workplace inspections;
- Follow instructions and training that was provided;
- Report hazardous conditions to one's supervisor/manager;
- Work in compliance with the OHS Act/Regulations & North Atlantic HSEMS;
- Properly use and maintain PPE and other devices or apparel required under the OHS Act; and
- Co-operate with the employer, manager/ supervisor, co- workers, OHS Committee/WHSR and anyone exercising a duty imposed under the legislation.

OHS Committee / WHSR

- OHS Committee / WHSR will communicate serious issues/concerns by employees to management;
- Participate in workplace inspections;
- Receive OHS concerns, issues or complaints and make recommendations;

- Establish and promote health and safety;
- Maintain record of activities; and
- Co-operate with regulatory government department/agencies.

Contractor

- Abide by the NL OHS Act/ Regulations, North Atlantic's HSEMS as well as site safety requirements; and
- Provide North Atlantic proof of Insurance, Letter of Good Standing from Workplace NL, Newfoundland and Labrador Construction Safety Association (NLCSA) Certificate of Recognition (COR) (if required), OHS Policy or any other requirement as per contractual agreements.

4.6.2.2 Planning

For the Project, North Atlantic is taking a structured approach to environmental planning by developing targeted management plans for key environmental aspects. A Hazard Identification process will be conducted to assess risks associated with upcoming Construction, O&M, and Decommissioning Phases and to meet legal and regulatory requirements identified through the Project Registration process. Clear objectives and targets are being set to monitor the effectiveness of these plans.

By incorporating HSE practices early, the Project has proactively built mitigation measures into project design. These include:

- Meeting water quality standards with appropriate treatment;
- Considering climate change, such as rising marine levels, in site selection;
- Using low-emission equipment during construction;
- Implementing a Diversity, Equity and Inclusion Plan for workforce development; and
- Designing energy-efficient buildings.

4.6.2.3 Management Plans

To address the commitments identified in the HSE Policy, North Atlantic has identified 15 elements to guide the HSE Management System. Each element consists of a Standard Operating Procedure (SOP), with supporting HSE programs and Safe Work Practices (SWP) and/or HSE forms as required.

The following is a list of the 15 HSE Elements with reference document numbers:

- Element # 1 SOP-HSE-001 Leadership and Administration.
- Element # 2 SOP-HSE-002 OH & S Committee.
- Element # 3 SOP-HSE-003 Hazard Recognition, Evaluation & Control.
- Element # 4 SOP-HSE-004 PPE Management.
- Element # 5 SOP-HSE-005 Training and Education.
- Element # 6 SOP-HSE-006 HSE Information & Communication Management.
- Element # 7 SOP-HSE-007 Incident Management.
- Element # 8 SOP-HSE-008 HSE Inspection Management.
- Element # 9 SOP-HSE-009 Emergency Preparedness & Security.
- Element # 10 SOP-HSE-010 Environmental Management.
- Element # 11 SOP-HSE-011 Disability Management.
- Element # 12 SOP-HSE-012 Contractor Management.
- Element # 13 SOP-HSE-013 HSE Regulatory Management.
- Element # 14 SOP-HSE-014 Measurement and Analysis.
- Element # 15 SOP-HSE-015 HSE Program Management.

In addition to the North Atlantic HSE elements, Table 4.6.2-1 provides a summary of the required plans as described in the Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects (EAR-GWH). These plans will be implemented in all Project Phases including Construction, O&M, Decommissioning and Rehabilitation, and ultimate closure.

Table 4.6.2-1 Summary of Plans Required for North Atlantic Wind to Hydrogen Project.

Location	Plan Title	Components	Notes
Ch. 9	Environmental Protection Plan	a. Purpose b. Scope and Objectives c. North Atlantic HSE Policies d. Regulatory Requirements e. Roles and Responsibilities f. Training g. General Environmental Protection Procedures	Section 9 provides an annotated table of contents for the Project Construction EPP. Future iterations (O&M Phase, Decommissioning and Rehabilitation Phase) will be tailored to reflect the relevant site activities and their associated protection procedures.

Location	Plan Title	Components	Notes
		<ul style="list-style-type: none"> h. Resource Specific Protection Procedures i. Environmental Mitigation Measures j. Contingency and Monitoring Plan k. Compliance Monitoring and Reporting l. Contact List 	
<p>App. E and Updated in Appendix 3</p>	<p>Transportation Impact Study and Traffic Management Plan</p>	<ul style="list-style-type: none"> a. Transportation Impact Study <ul style="list-style-type: none"> • Road Infrastructure • Existing Traffic • Wind Farm Access Road Design Considerations • Construction, O&M, and Decommissioning and Rehabilitation Phase Traffic b. Traffic Management Plan <ul style="list-style-type: none"> • Oversized and Overweight Materials, Equipment and Vehicles • Driver Education • Driver Conditions • Traffic Control Measures • Monitoring and Reporting 	<p>The Transportation Impact Study includes the review of the location of the proposed Wind Farm access road, the geometric configuration of the proposed intersection with the TCH and a sight line analysis in accordance with the request by DoTI. The TMP discusses management of oversized and overweight vehicles, outlines strategies to manage construction-related travel and disruptions to traffic flow during the Project's implementation.</p>
<p>App. M</p>	<p>Emergency Response/Contingency Plan</p>	<ul style="list-style-type: none"> a. Site Information b. Risk Assessment and Incident Classification c. Incident Command System d. Emergency Communication e. Emergency Response Plan f. Training and Testing 	<p>This ERP provides processes and guidelines for emergencies involving hazardous materials that can occur with equipment in-service, in storage or during transportation for all employees of the Project. The primary purpose of the response plan is to implement a structured program for the prevention of, preparation for, response to and recovery from an environmental emergency or danger to human life or health at the CBC and Sunnyside Facilities.</p>
<p>App. N and Updated in Appendix 6</p>	<p>Waste Management Plan</p>	<ul style="list-style-type: none"> a. Document Control b. Project Description c. Reference Documentation d. Roles and Responsibilities e. Waste Management f. Training 	<p>Provides the processes and guidelines to be followed by all employees of North Atlantic to ensure the proper storage, handling and disposal of waste material. identifies requirements and actions for the management of waste generated by the Project and applies to all components of the Project, including onshore wind</p>

Location	Plan Title	Components	Notes
			energy generation, hydrogen production, dehydrogenation processing, derivative storage, and exporting.
App. O	Hazardous Materials Response and Training Plan	<ul style="list-style-type: none"> a. Objective b. Responsibilities c. Training Requirements d. Training Records e. Proof of Competency f. Refresher and supplemental training 	Provides the appropriate information and tools for consistency in its application while retaining appropriate site-specific practices. This training plan covers the mandatory practices that assure adequate training and qualification of personnel whose job duties impact and influence hazardous material response and handling. The program includes initial, and refresher training and qualification.
App. P	Public Participation Plan	<ul style="list-style-type: none"> a. Scope and Objectives b. Roles and Responsibilities c. Engagement Strategy d. Communication and Engagement Tools e. Inquiry and Complaints Resolution Protocol f. Engagement During Project Phases g. Indigenous Engagement h. Emergency Response i. Monitoring and Reporting j. Evaluation and Updating 	Describes the plan to facilitate engagement and consultation with stakeholder and Indigenous peoples during the Construction, O&M and Decommissioning and Rehabilitation Phases. The plan details show and when public and key stakeholders' participation will occur.
App. Q	Workforce and Employment Plan	<ul style="list-style-type: none"> a. Introduction and Labour Force b. Scope c. Workforce Requirements and Forecast d. Commitments to Benefits and Diversity, Equity, and Inclusion e. Recruitment and Retention f. Training and Development g. Stakeholder Engagement h. Monitoring and Reporting 	The Workforce and Employment Plan outlines workforce requirements, recruitment, training and development, and retention strategies as well as reporting requirements for the Project.
App. T	Domestic Woodcutting Consultation Plan	<ul style="list-style-type: none"> a. Purpose and Objectives b. Existing Conditions c. Environmental Effects and Mitigation Measures d. Consultation Strategy 	This plan ensures the appropriate stakeholders are identified and engaged in a meaningful manner throughout all phases of the Project, by outlining the planned consultation methods and activities with domestic wood harvesters and other related stakeholders in the PA.

Location	Plan Title	Components	Notes
To be developed as needed to support regulatory permitting.	Environmental effects follow up and monitoring programs (EEMPs)	<ul style="list-style-type: none"> a. Species at Risk Impact Monitoring and Mitigation Plan b. Post Construction Monitoring Plan 	Mitigation, monitoring, and adaptive management frameworks for the SAR and species of concern, as it relates to the Project. Aims to meet the requirements for the issuance of a Section 19 permit under the NL ESA.
To be developed as needed to support regulatory permitting.	Water Management Plan	<ul style="list-style-type: none"> a. <u>Wind Farm</u> b. <u>Access Roads</u> c. <u>Quarries</u> d. <u>Hydrogen Generation Plant (HGP)</u> e. <u>Hydrogenation Plant (HP)</u> f. <u>Toluene/MCH Storage and Transfer Infrastructure</u> g. <u>Transmission Line and Collector System</u> h. <u>Laydown Areas and Construction Staging Areas</u> i. <u>Stormwater and Drainage Systems</u> j. <u>Watercourse Crossings</u> k. <u>Industrial Water Supply Infrastructure</u> 	This plan will be developed for all Project components. It will include mitigation measures for erosion and sediment control, protection of waterbodies and wetlands, fish protection at water intakes, watercourse crossing design, spill prevention, and regulatory compliance. The WMP will also outline procedures for monitoring water quality and quantity during construction, operation, and decommissioning. Real-time monitoring stations will be installed before operations, with final locations confirmed during FEED based on drainage patterns, discharge points, and water use requirements.
To be developed as needed to support regulatory permitting.	Erosion and Sediment Control Plan	<ul style="list-style-type: none"> a. <u>Wind Farm</u> b. <u>Access Roads</u> c. <u>Quarries and Related Borrow Areas</u> d. <u>Transmission Line and Collector System</u> e. <u>Watercourse Crossings (culverts and bridges)</u> f. <u>Hydrogen Generation Plant (HGP)</u> g. <u>Hydrogenation Plant (HP)</u> h. <u>Toluene/MCH Storage and Transfer Infrastructure</u> i. <u>Laydown Areas and Construction Staging Areas</u> j. <u>Stormwater Drainage Systems</u> k. <u>Areas of Ground Disturbance (grading, excavation, clearing)</u> l. <u>Wetland and Waterbody Adjacent Work Zones</u> 	An Erosion and Sediment Control Plan (ESCP) will be developed prior to early works and maintained for the full Project life, with updates as needed. Finalization will occur after FEED in consultation with DFO and NL DECC-WRMD. The ESCP will incorporate mitigation measures from Section 4.5, including infrastructure siting on stable ground, compliant culvert and bridge installation, erosion and sediment controls at watercourse crossings and near wetlands, and maintenance of controls until revegetation is complete. The ESCP will guide construction, operations, and decommissioning to protect water resources and ensure regulatory compliance.

Location	Plan Title	Components	Notes
<p><u>To be developed as needed to support regulatory permitting</u></p>	<p><u>Avifauna Management Plan</u></p>	<ul style="list-style-type: none"> a. <u>Wind Turbines</u> b. <u>Wind Farm Operations Systems (including real-time bird/bat monitoring and curtailment systems)</u> c. <u>Access Roads</u> d. <u>Transmission Line and Collector System</u> e. <u>Construction Staging and Laydown Areas</u> f. <u>Vegetation Clearing Areas</u> g. <u>Lighting Systems (turbines, buildings, and construction lighting)</u> h. <u>Hydrogen Generation Plant (HGP)</u> i. <u>Hydrogenation Plant (HP)</u> j. <u>Toluene/MCH Storage and Transfer Infrastructure</u> k. <u>Decommissioning Work Areas</u> l. <u>Environmental Effects Monitoring Program Interfaces</u> m. <u>Habitat Areas Supporting Migratory Birds and SAR (breeding, staging, and migration habitat within the PA/LAA)</u> 	<p><u>This Plan will be developed in consultation with FFA and ECCO to minimize effects on migratory birds protected under the MBCA and species listed under SARA or the Wild Life Act. The Plan will outline measures for all Project phases, including timing of vegetation clearing, nest surveys and protective buffers, construction lighting minimization, and procedures for incidental nest encounters. During O&M, the Plan will address turbine-related risks through real-time bird/bat monitoring with operational curtailment, lighting design to reduce attraction, and post-construction mortality monitoring with adaptive management. Decommissioning activities will be scheduled to avoid sensitive periods and reduce noise and lighting where feasible. The Plan will define roles, training, reporting, and integration with the Environmental Effects Monitoring Plan.</u></p>
<p><u>To be developed as needed to support regulatory permitting</u></p>	<p><u>Decommissioning and Rehabilitation Plan</u></p>	<ul style="list-style-type: none"> a. <u>Freshwater Intake Decommissioning</u> b. <u>Marine Outfall Decommissioning</u> c. <u>Electrical Infrastructure Decommissioning Responsibilities</u> d. <u>Infrastructure Removal and Site Rehabilitation</u> e. <u>Decommissioning of Provincial Roadway Access Points</u> f. <u>Drainage and Catchment Area Infrastructure Decommissioning</u> g. <u>Waste Management During Decommissioning</u> h. <u>Consultation and Regulatory Coordination</u> 	<p><u>This plan will be developed once all Project infrastructure and final designs are confirmed, incorporating regulatory input and allowing for adaptation as technologies and guidelines evolve. The DRP will outline approaches for decommissioning shared freshwater intake infrastructure, addressing both new and existing marine outfalls, and confirming that North Atlantic maintains full cost responsibility for its electrical transmission assets. It will include timelines and methods for dismantling and removing project infrastructure, such as wind turbines, access roads, water crossings, hydrogen facilities, and transmission lines, alongside a rehabilitation and revegetation</u></p>

Location	Plan Title	Components	Notes
		i. <u>Adaptive Management and Future Updates</u>	<u>strategy to minimize invasive species. The plan will further address removal or modification of provincially owned roadway access, evaluate and mitigate any changes to drainage infrastructure, and apply the Waste Management Plan to guide hazardous and non-hazardous material handling, disposal, recycling, and opportunities for wind turbine blade repurposing.</u>

4.6.2.4 Plan Implementation

The implementation of each management plan will be supported by structured training, orientation, and engagement activities to ensure personnel clearly understand their assigned responsibilities. Staff will be introduced to the North Atlantic HSE Management System through formal briefings and practical workshops, which will also cover monitoring protocols and documentation requirements.

Continuous improvement will be driven by the application of the PDCA methodology—a well-established, iterative framework for enhancing operational performance. Within this model, the “Check” phase plays a critical role by evaluating the effectiveness of management strategies through performance measurement against defined environmental objectives and targets. These targets are developed with full awareness of applicable regulatory standards. Where feasible, internal performance thresholds are set conservatively, providing a buffer that allows for early corrective action and proactive compliance management.

In the event of an incident or performance deviation, such as a material spill, a structured review process will be initiated to identify root causes, document lessons learned, and highlight opportunities for improvement. The findings from this review will guide the development of corrective actions aimed at reducing the likelihood of recurrence and reinforcing system resilience.

4.6.2.5 Management Reviews and Assurance

The performance of the HSE Program is reviewed and communicated through regular HSE reports to keep management informed of the company’s HSE performance. The following data identifies some of the HSE inputs and outputs which will assist the HSE Specialist in ensuring the HSE program is communicated, maintained, and continuously improved.

Inputs:

- Monthly OHS inspection data;
- HSE training; and
- Incident data.

Outputs:

- Number of inspections conducted;
- Number of orientation/training sessions conducted;
- Number of incidents: Lost Time Injury (LTI) / Restricted Work Case (RWC) / Medical Aid (MA) / First Aide (FA); and
- Spills / environmental incident trends.